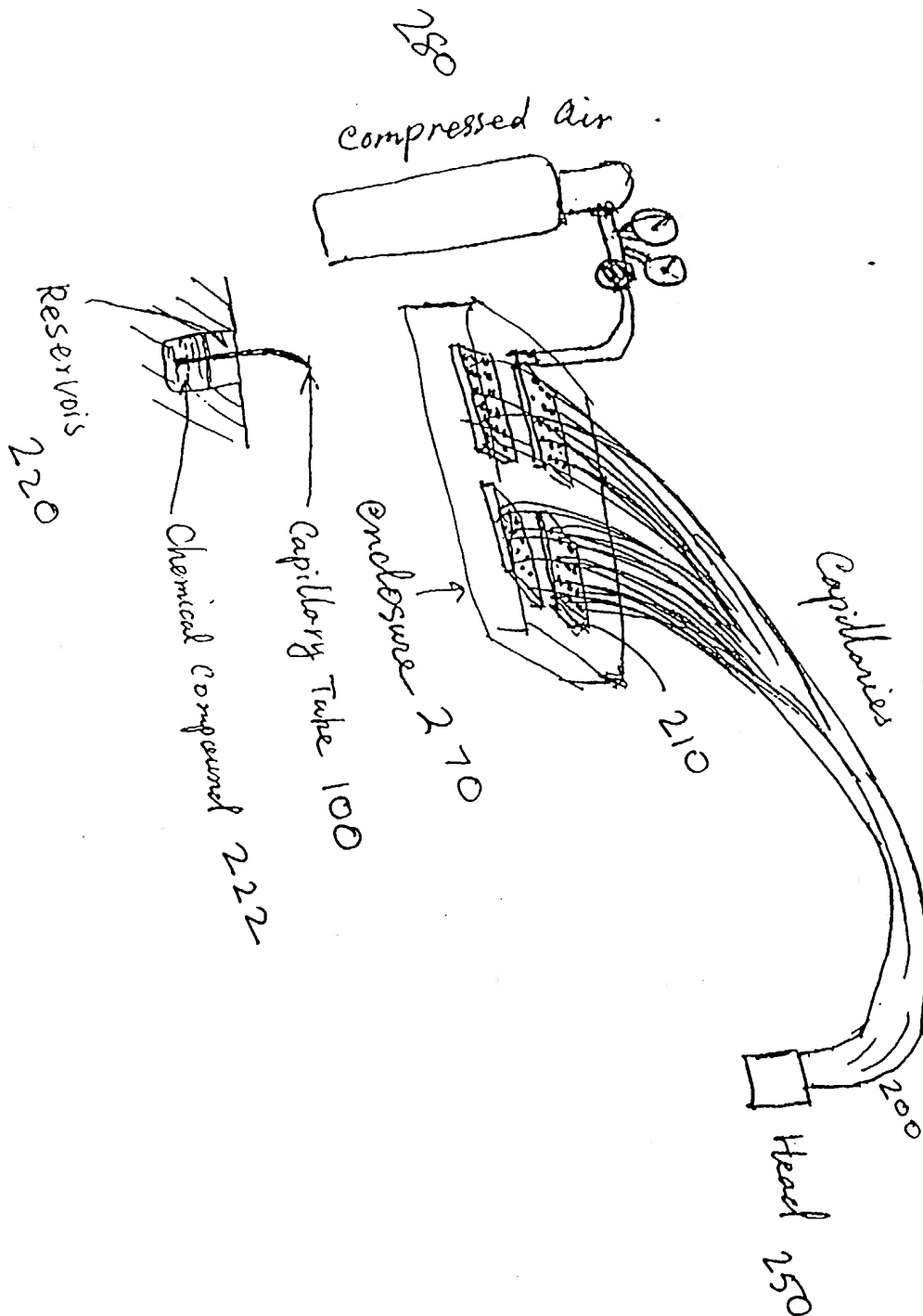


Figure 1

Fig. 2A



# XHTS

-- Microarrays and Fiber Bundles

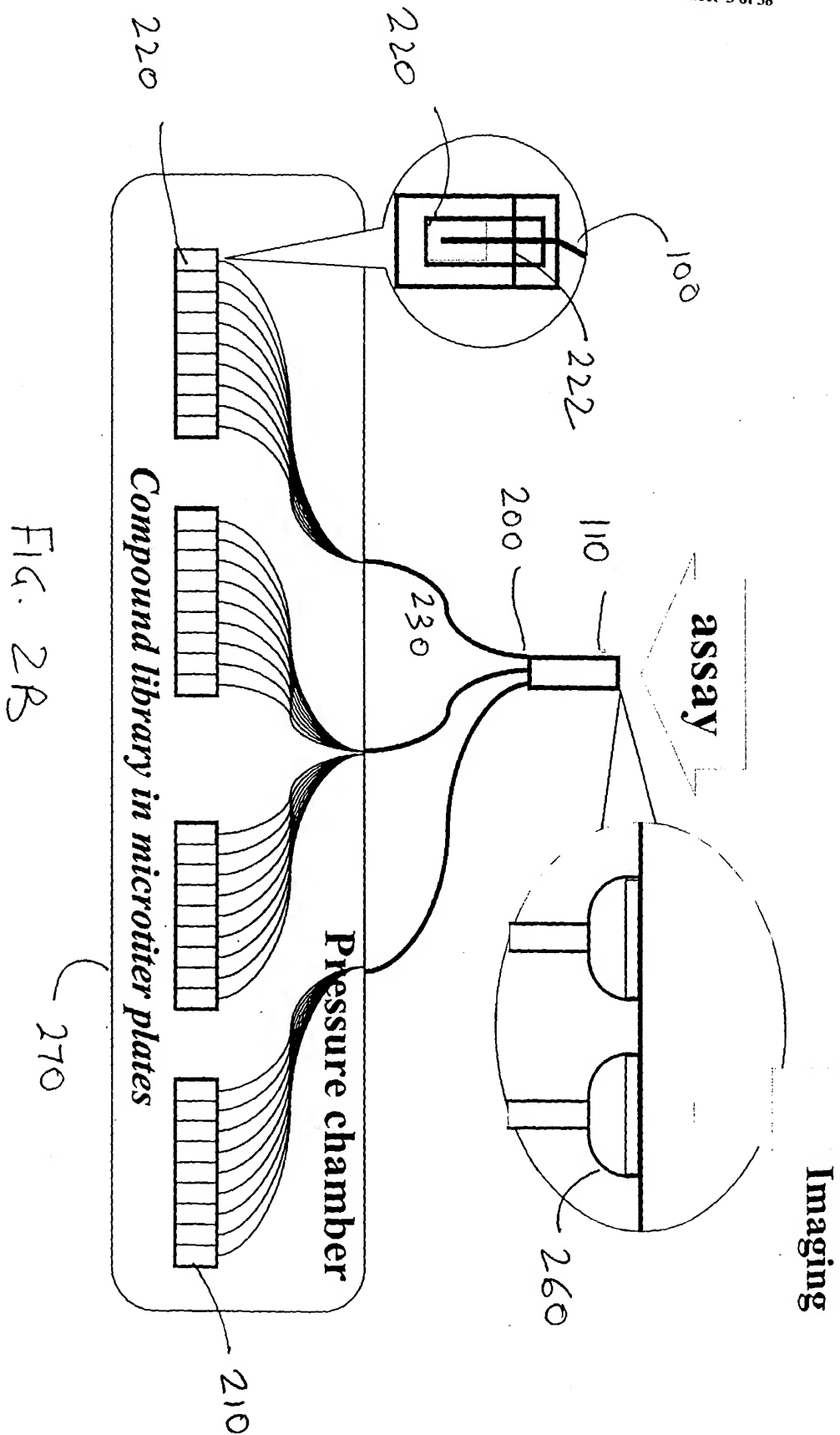


FIG. 2B

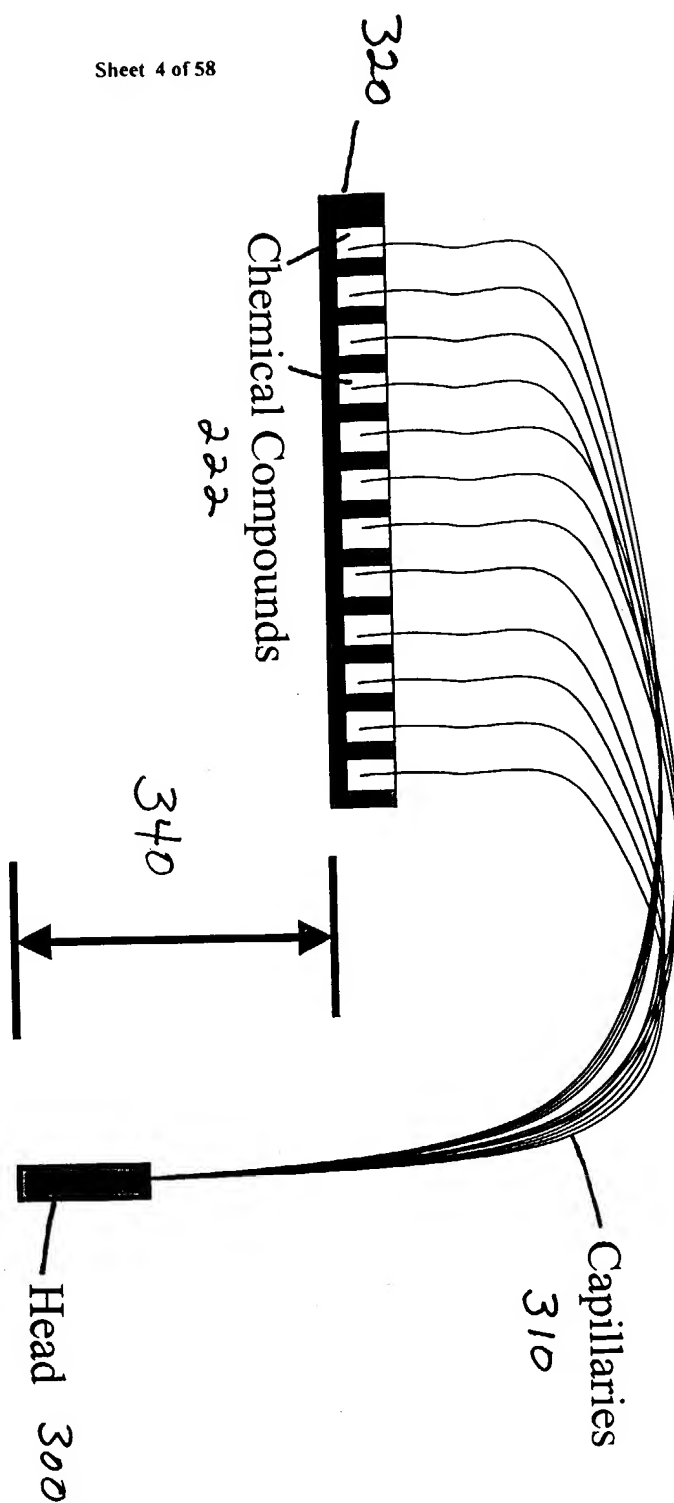


Figure 3

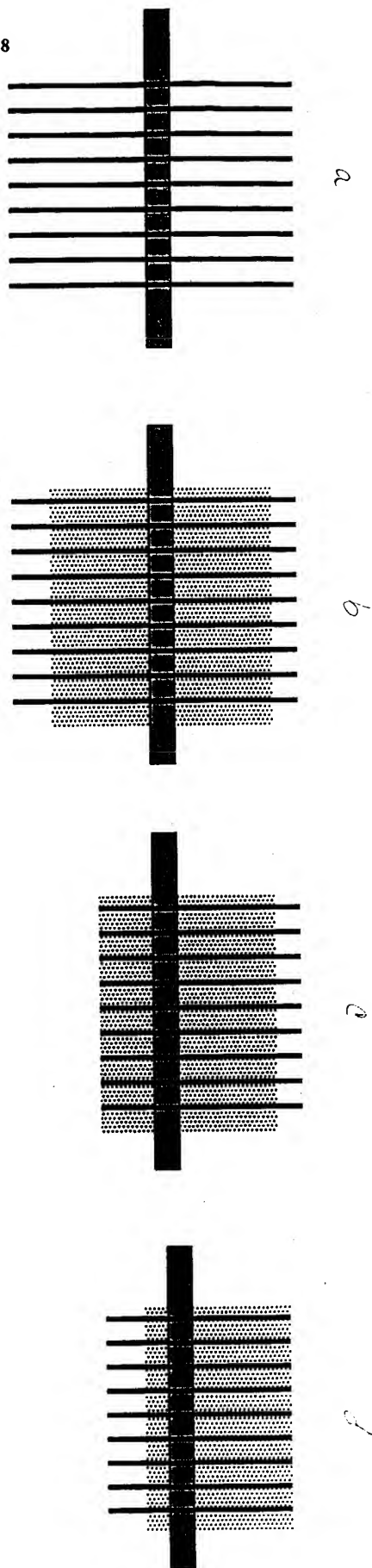


Fig. 4. Fabrication of delivery head using a guide plate

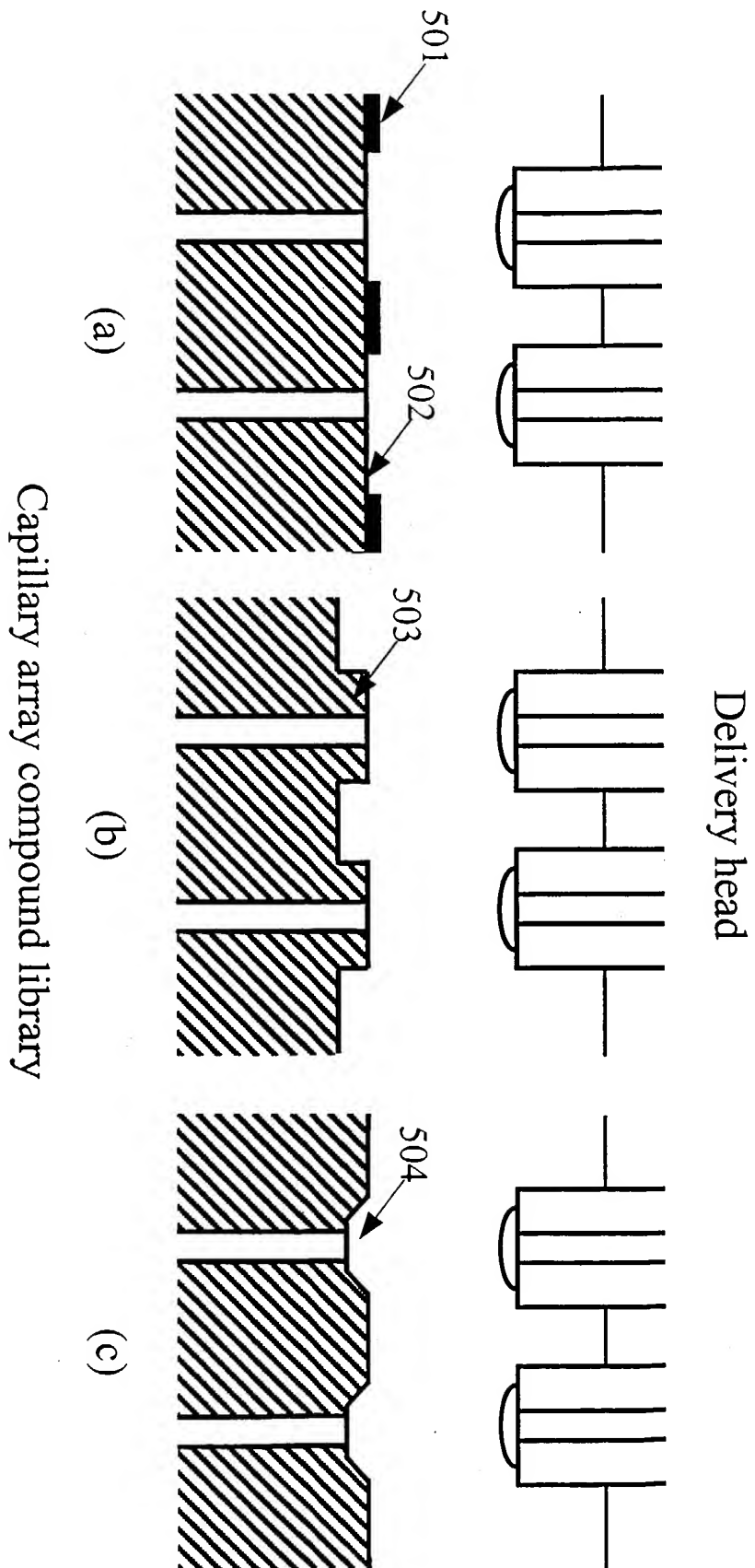


Fig. 5. Surface features on the surface of the capillary array compound library to prevent cross-contamination during compound loading

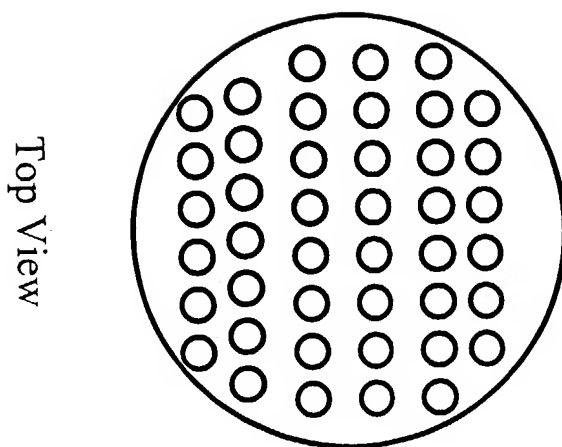
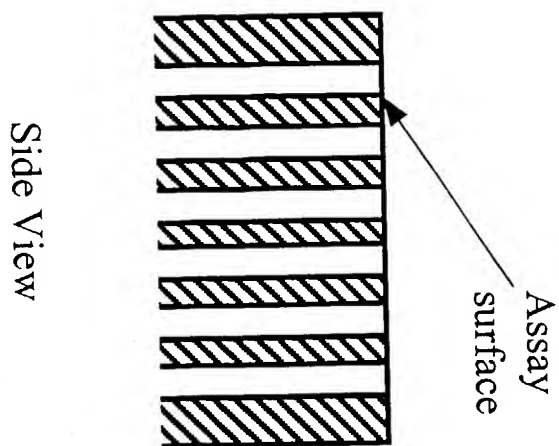


Fig. 6. Basic configuration of capillary array substrate for the portable compound library

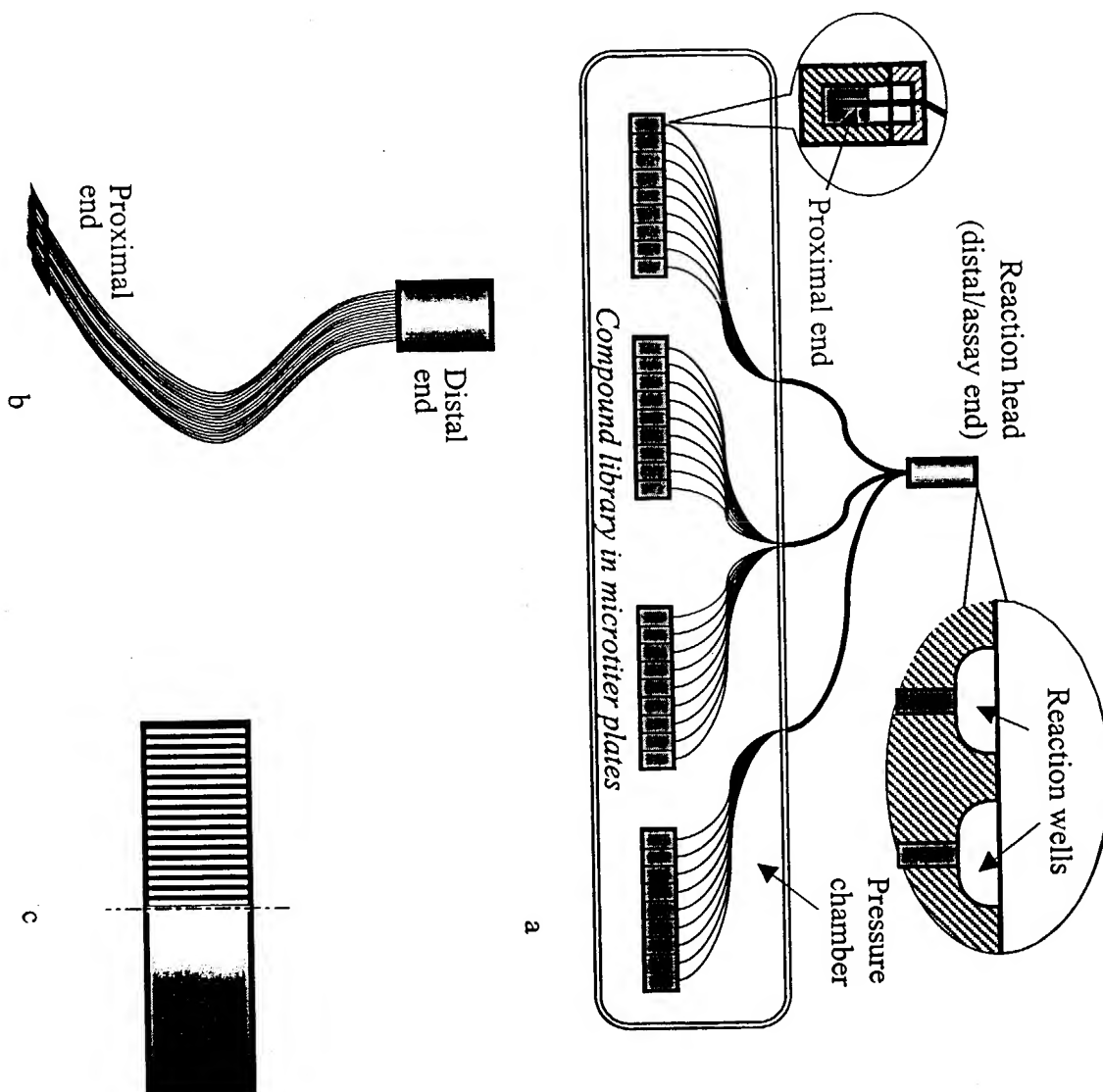
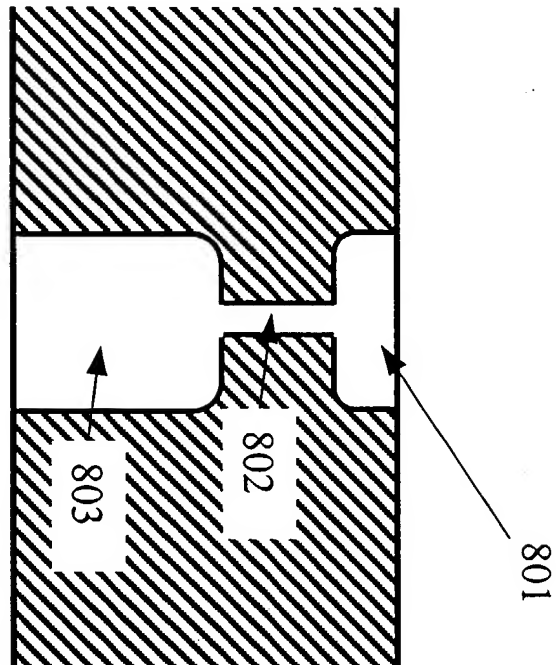


Fig. 7 The capillary array compound library in different formats





- 801 – Mixing/reaction well
- 802 – Flow regulator for reagent metering
- 803 – Compound reservoir

Fig. 8. Internal structure of a through hole in capillary array compound library

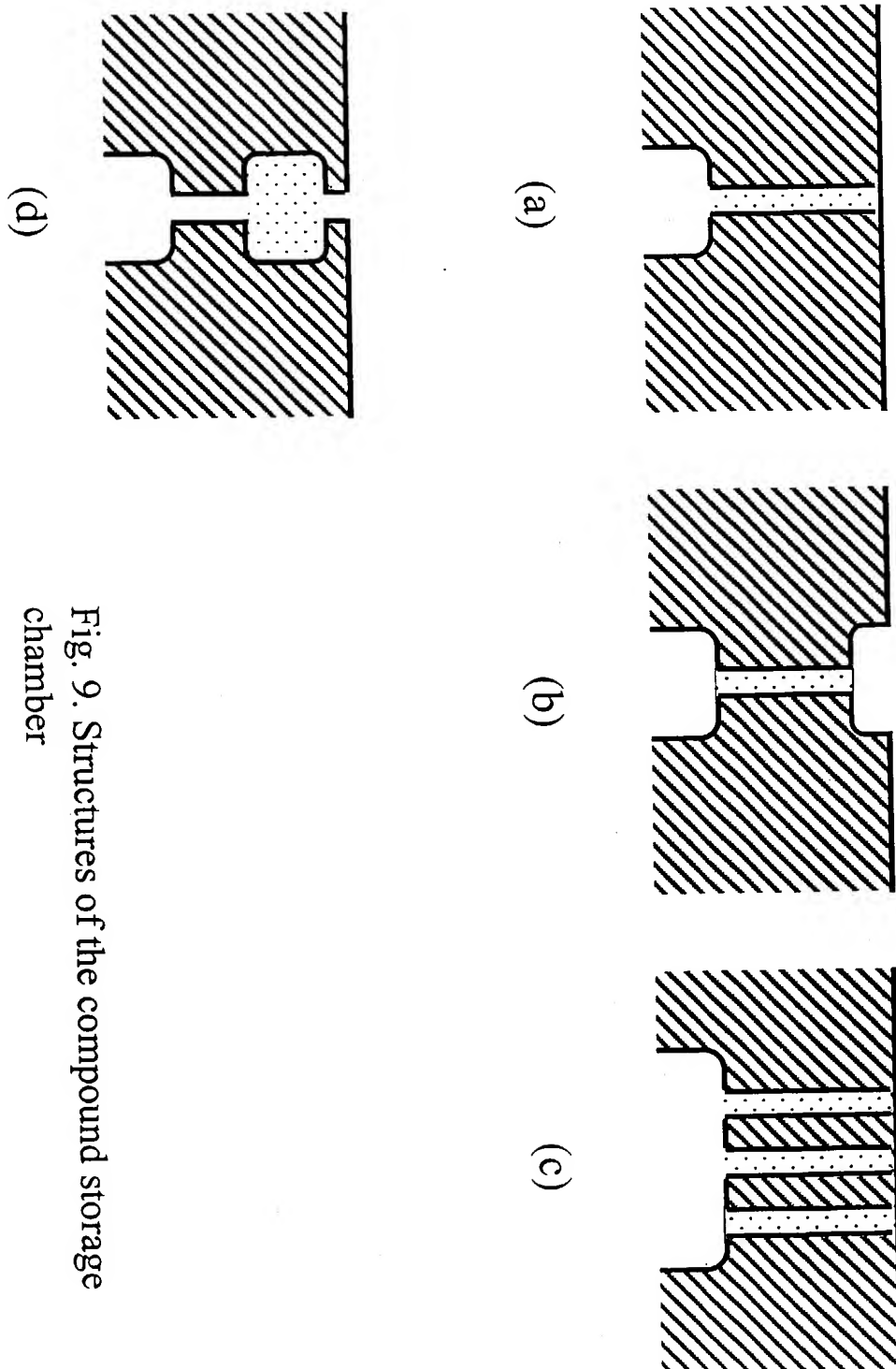


Fig. 9. Structures of the compound storage chamber

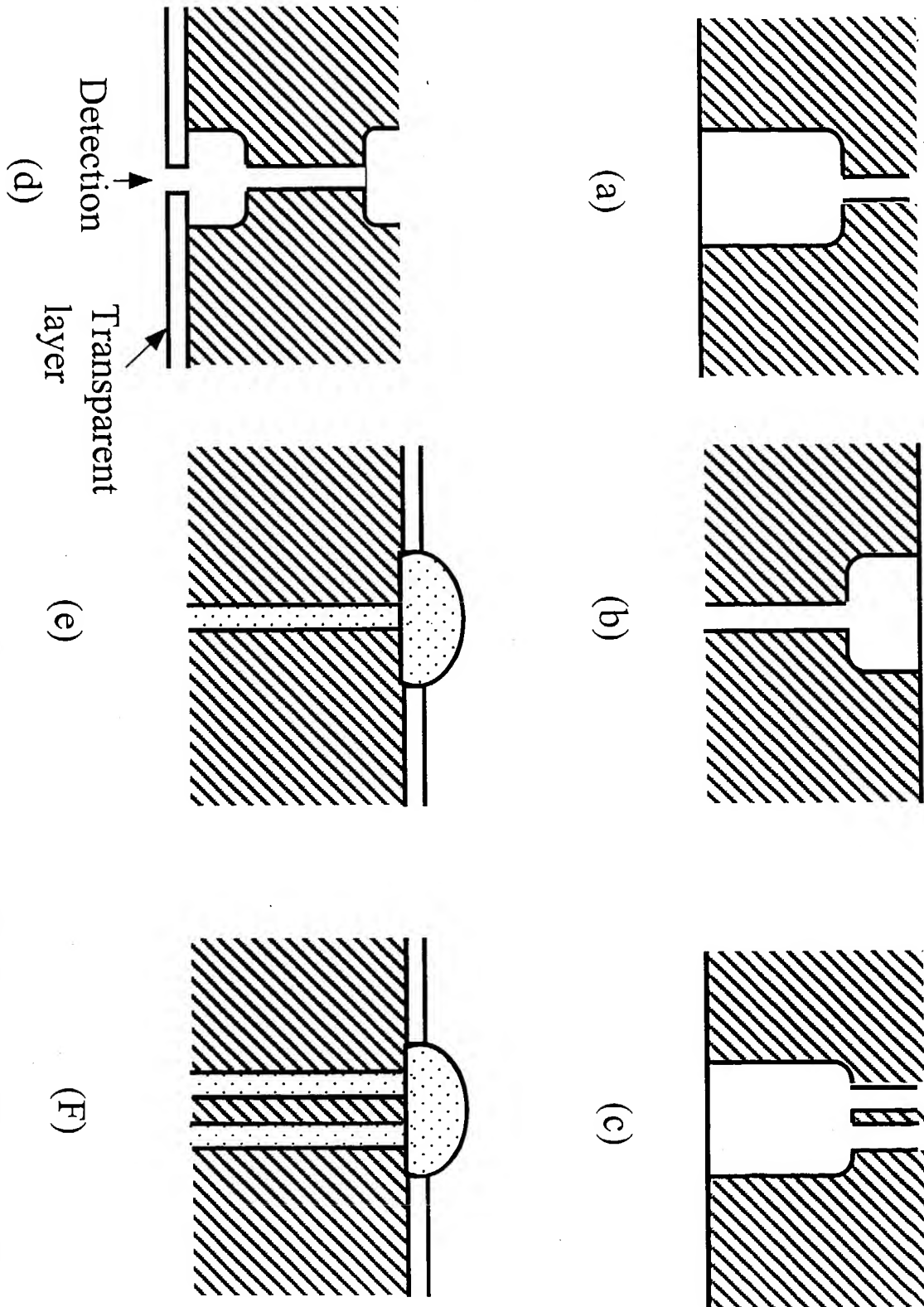
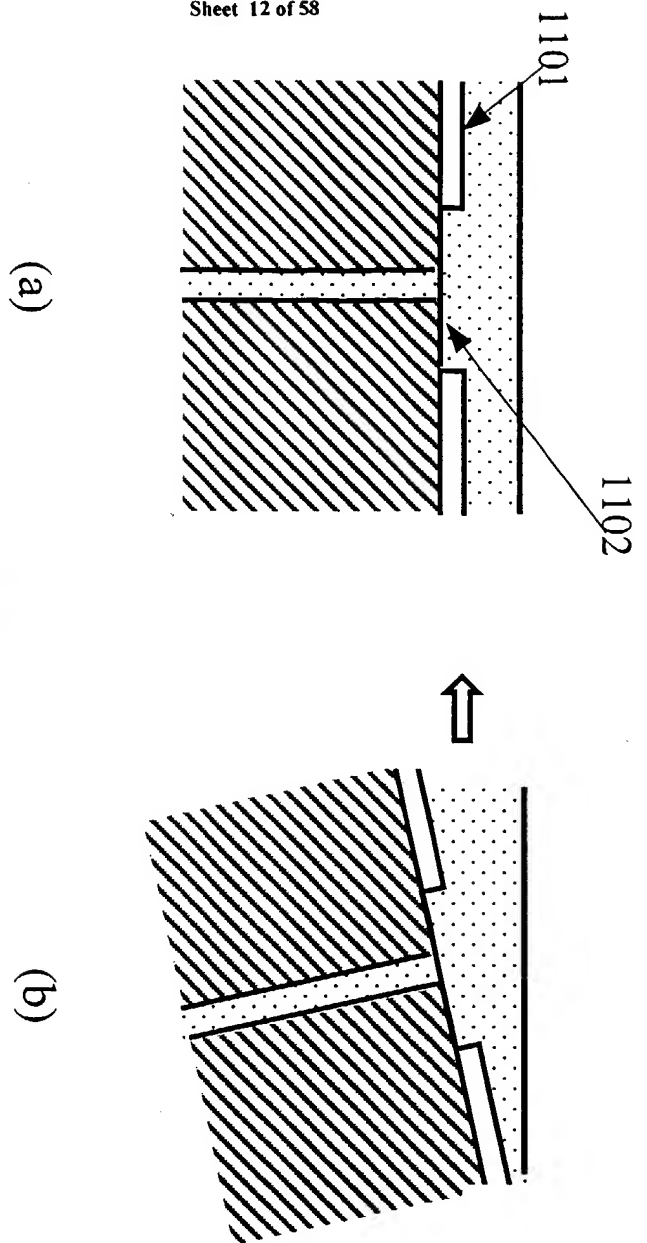
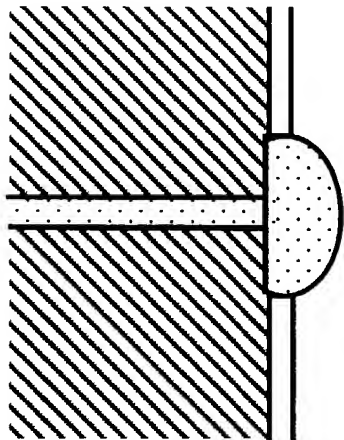


Fig. 10. Internal structures of mixing/reaction chamber



(a)



(b)

(c)

1101 – Hydrophobic coating  
 1102 – Hydrophilic coating

Fig. 11. Volume metering by surface tension patch

Fig. 12. Fluid regulator with side air tunnel

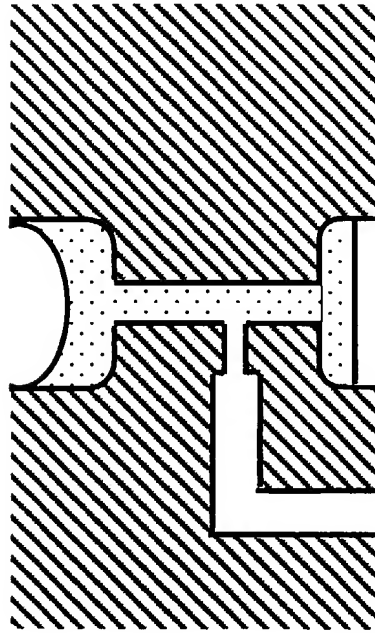


Fig. 13 Internal through hole structures to facilitate chamber volume  
metering and mixing

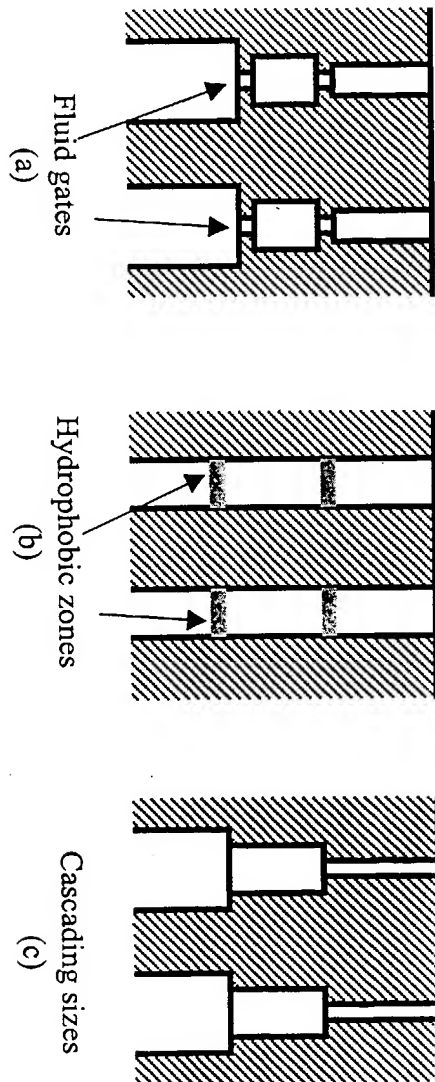


Fig. 14 Process of metering multiple reagents using  
interconnected chambers

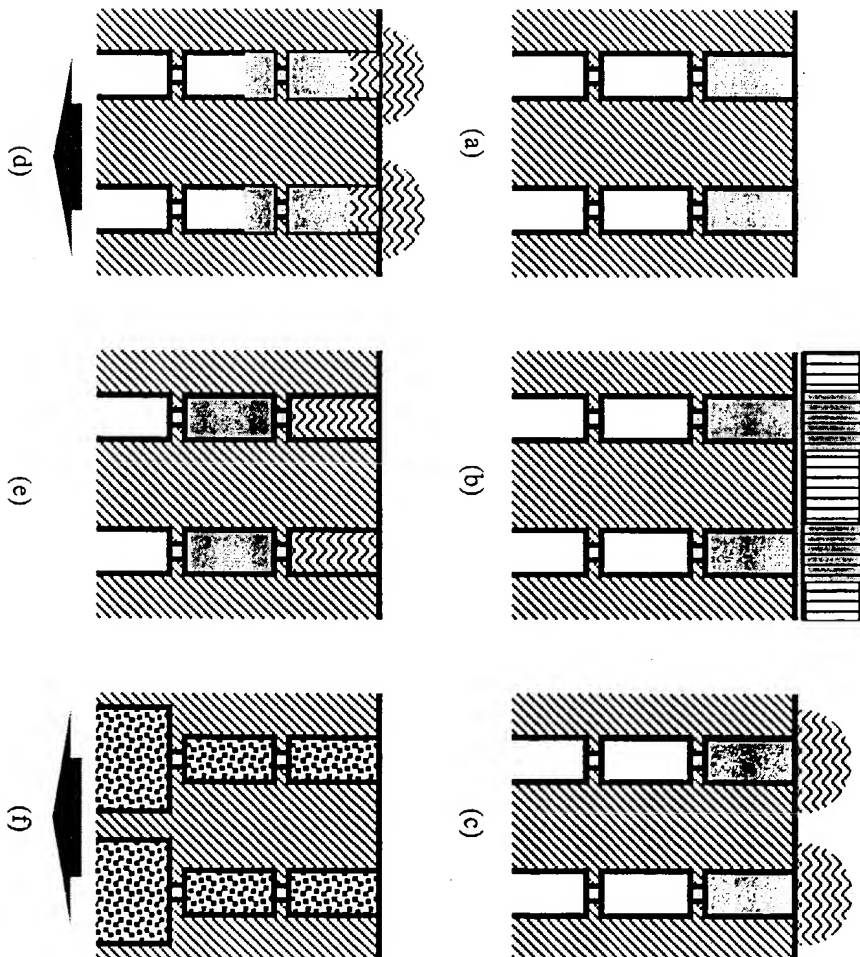
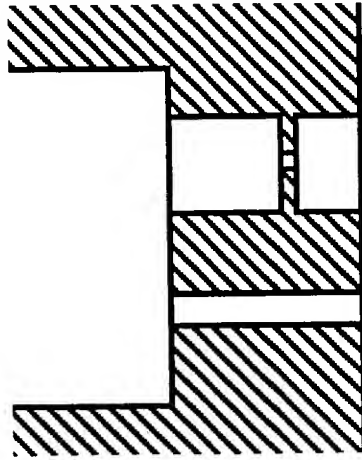


Fig. 15 Special through hole structure where multiple chambers links to a chamber in parallel





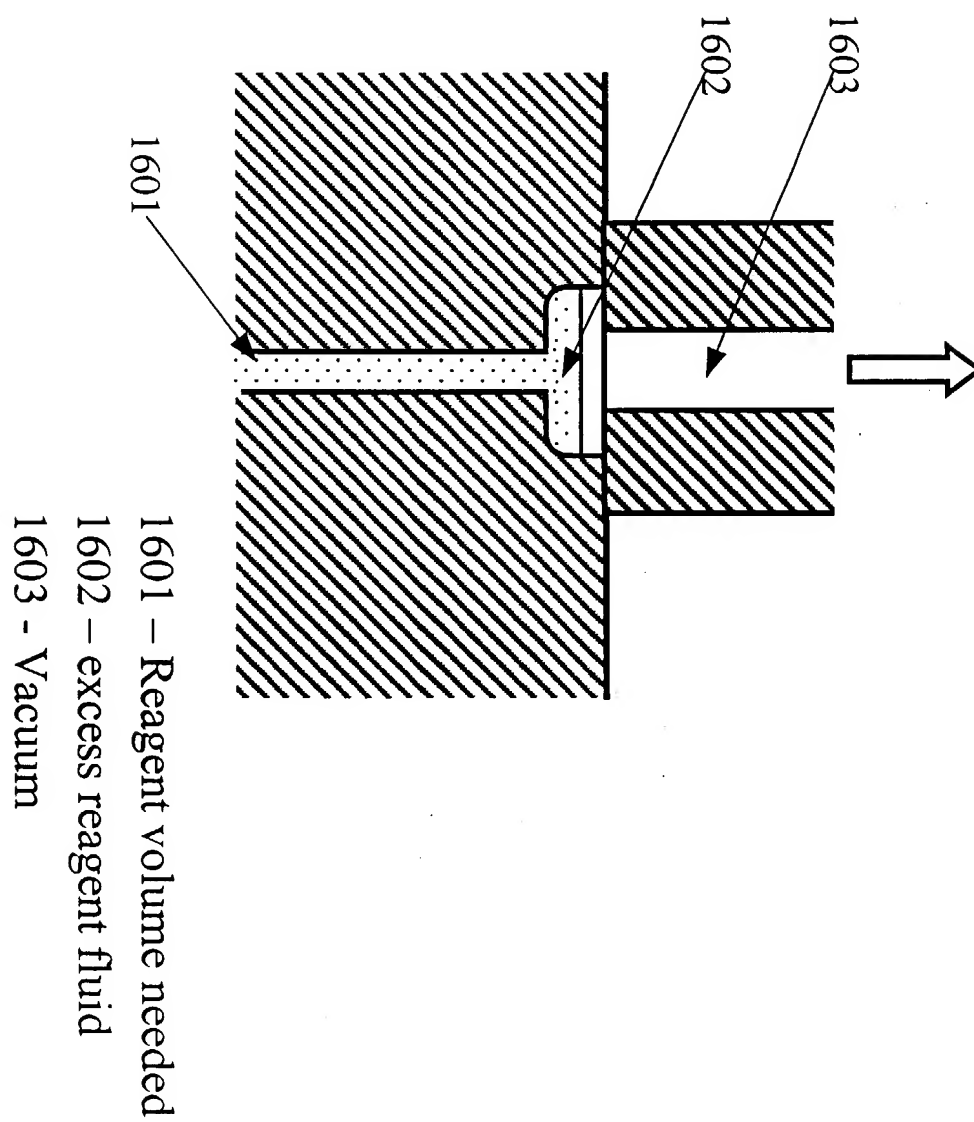


Fig. 16. Removal of excess fluid by vacuum

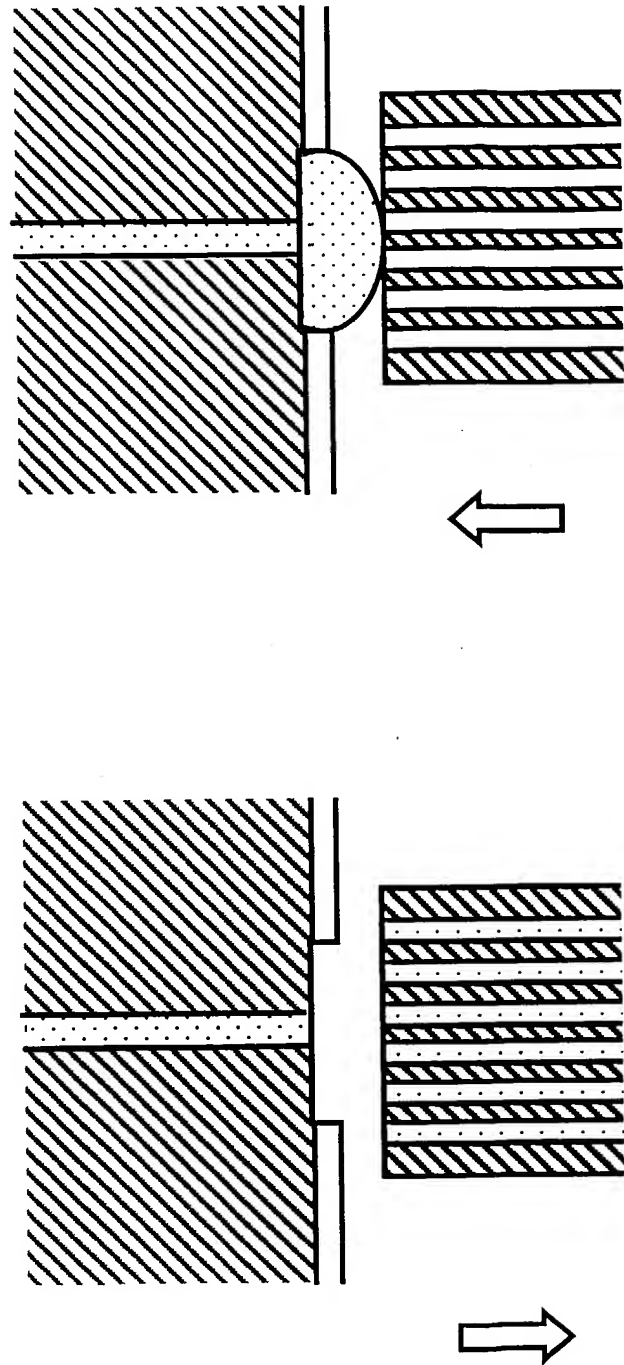
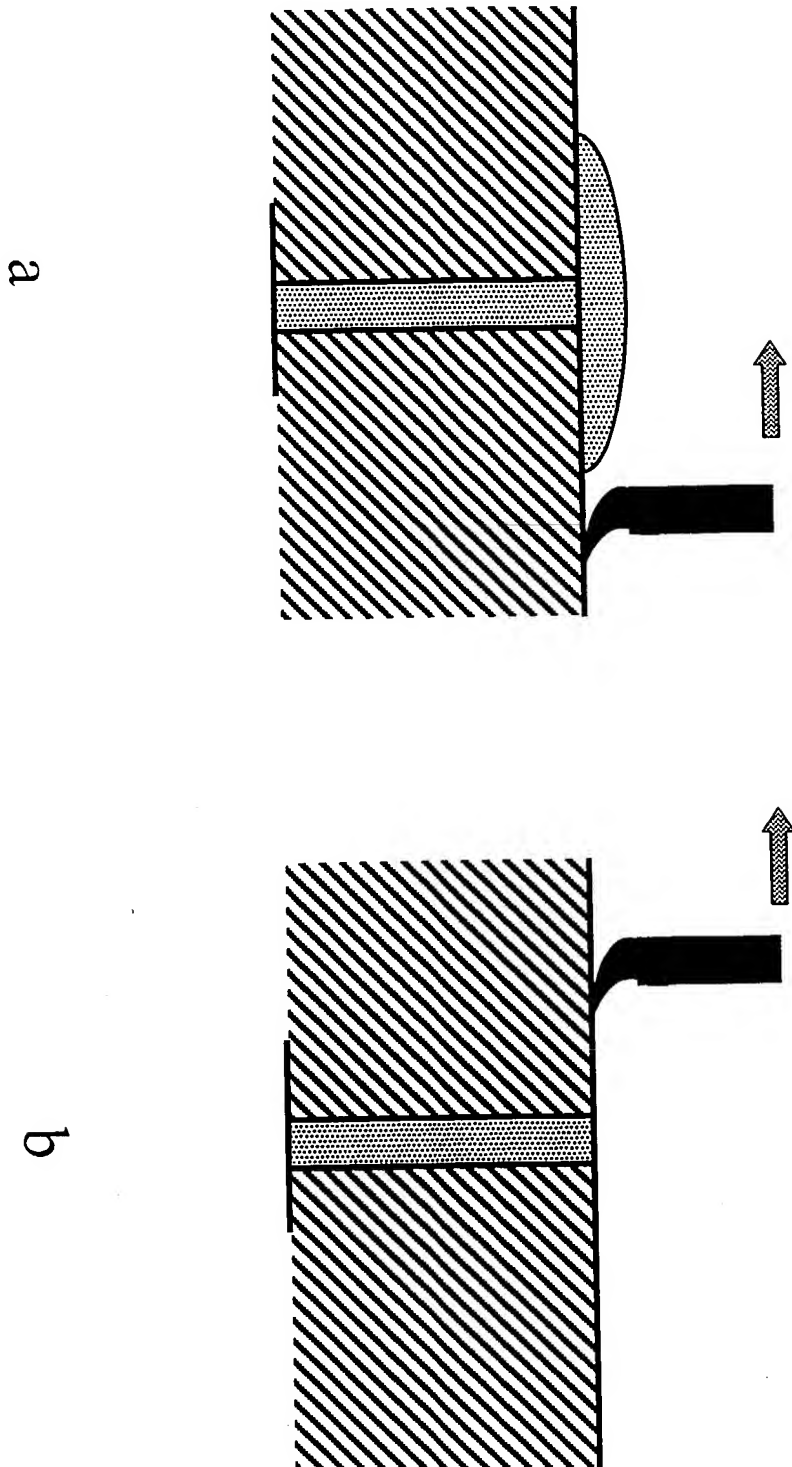


Fig. 17. Excess fluid removal using a second capillary array

Fig. 18. Excess Fluid Removal by Wiping



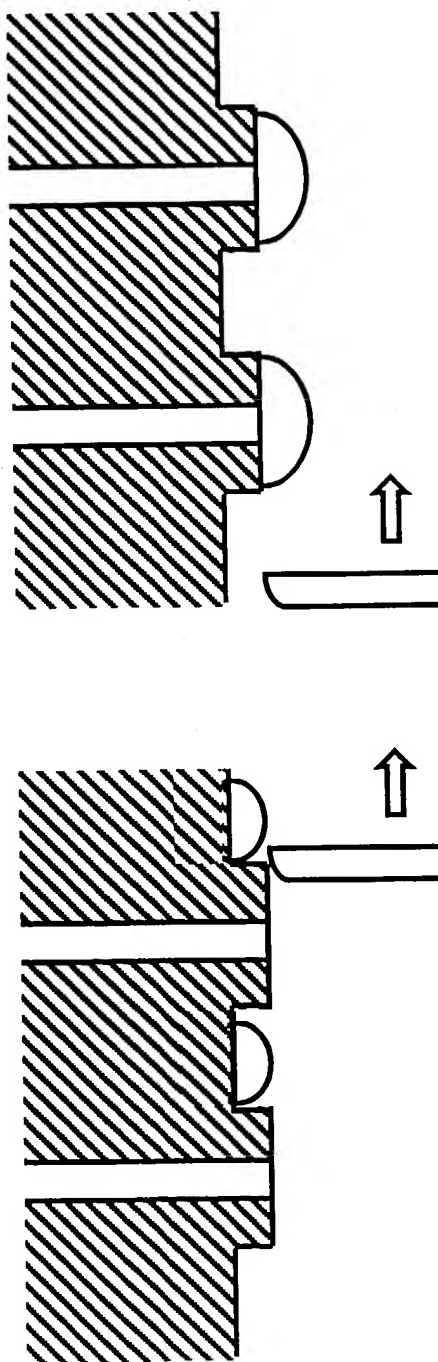


Fig. 19. A method for reducing cross-contamination between adjacent holes during excess fluid removal

Fig. 20 Use Reflection Wall of Reaction Chamber to Enhance Optical  
 Signal of the Assay

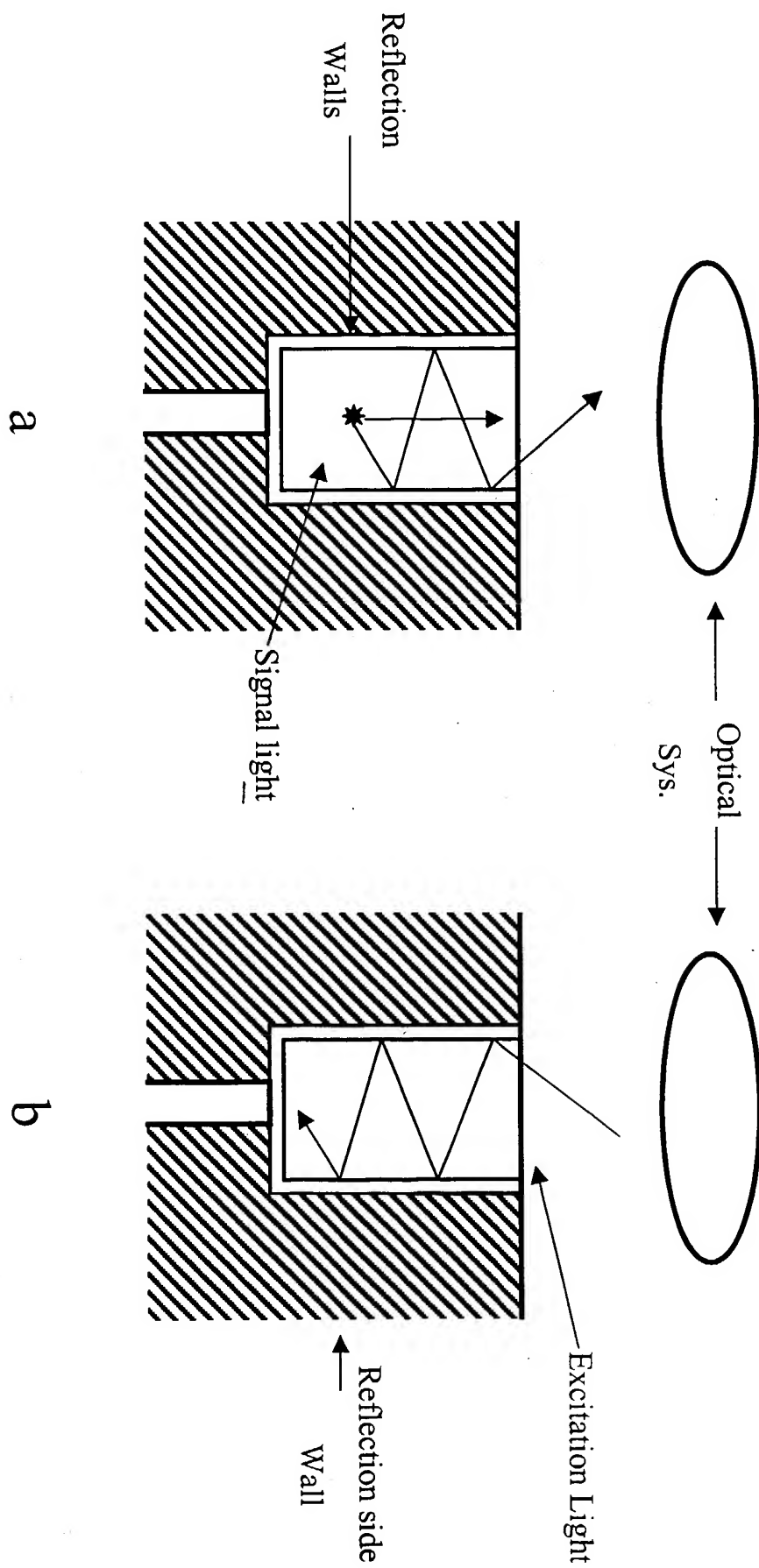
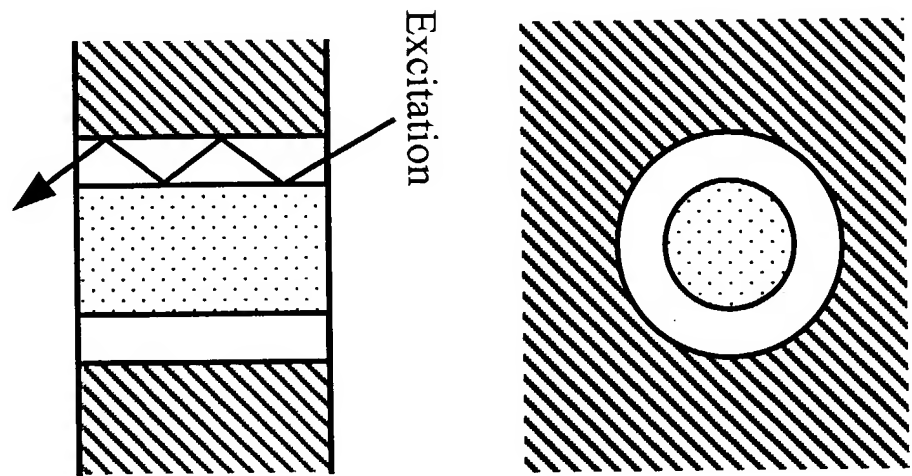
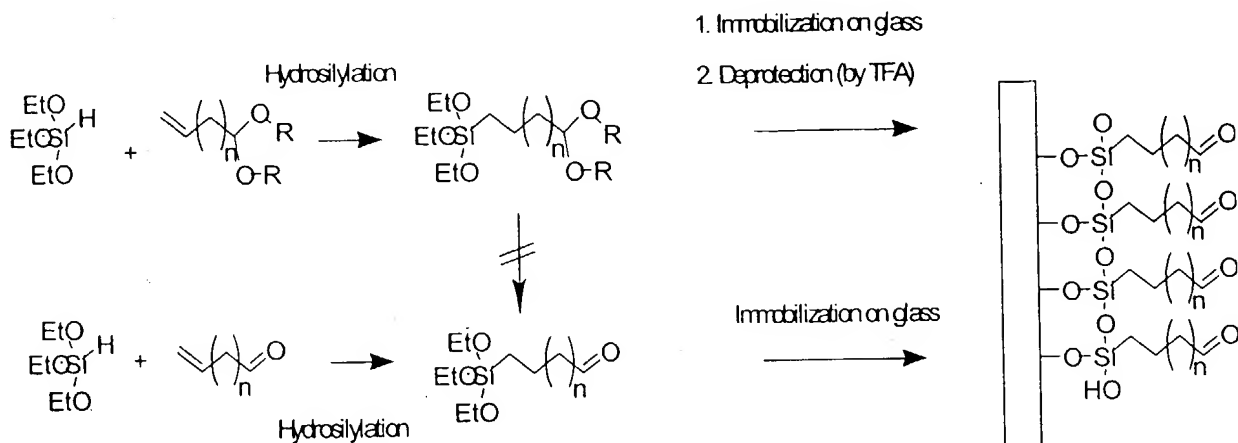


Fig21 Light guiding capillary





$n=0, 1, 8$   
 $R=\text{CH}_3, \text{C}_2\text{H}_5, \text{C}_2\text{H}_4$

FIG 22A

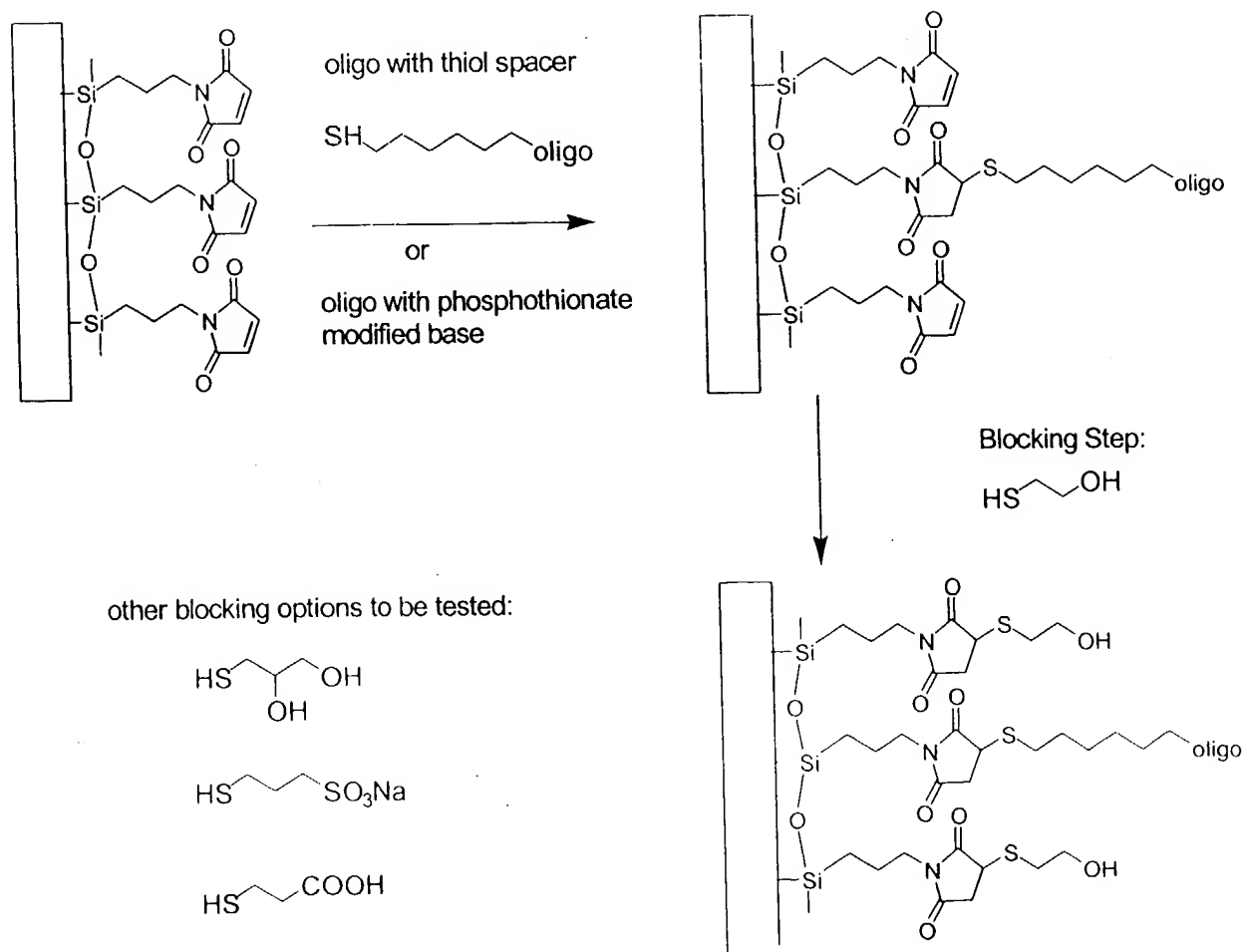


FIG 22B

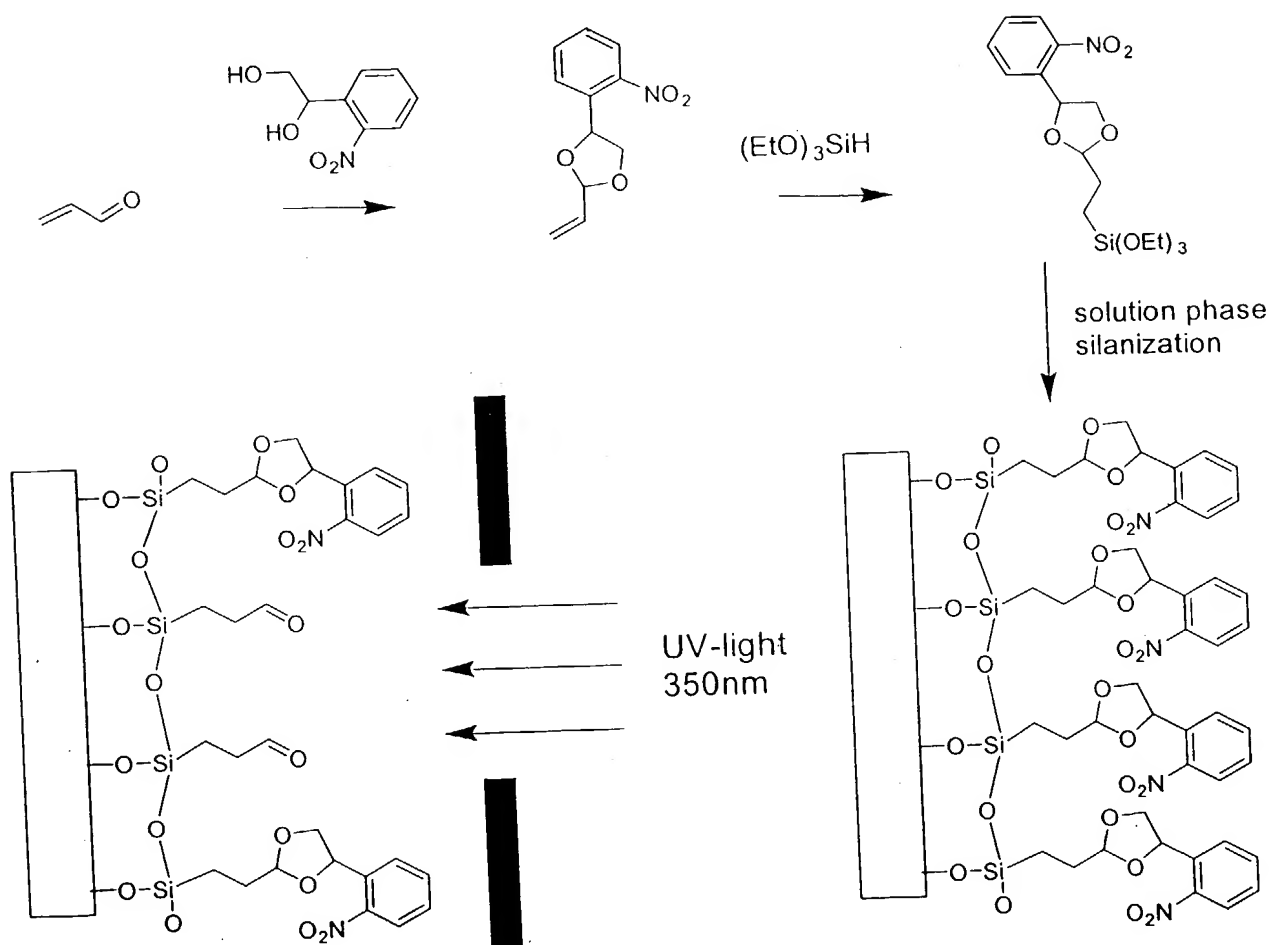
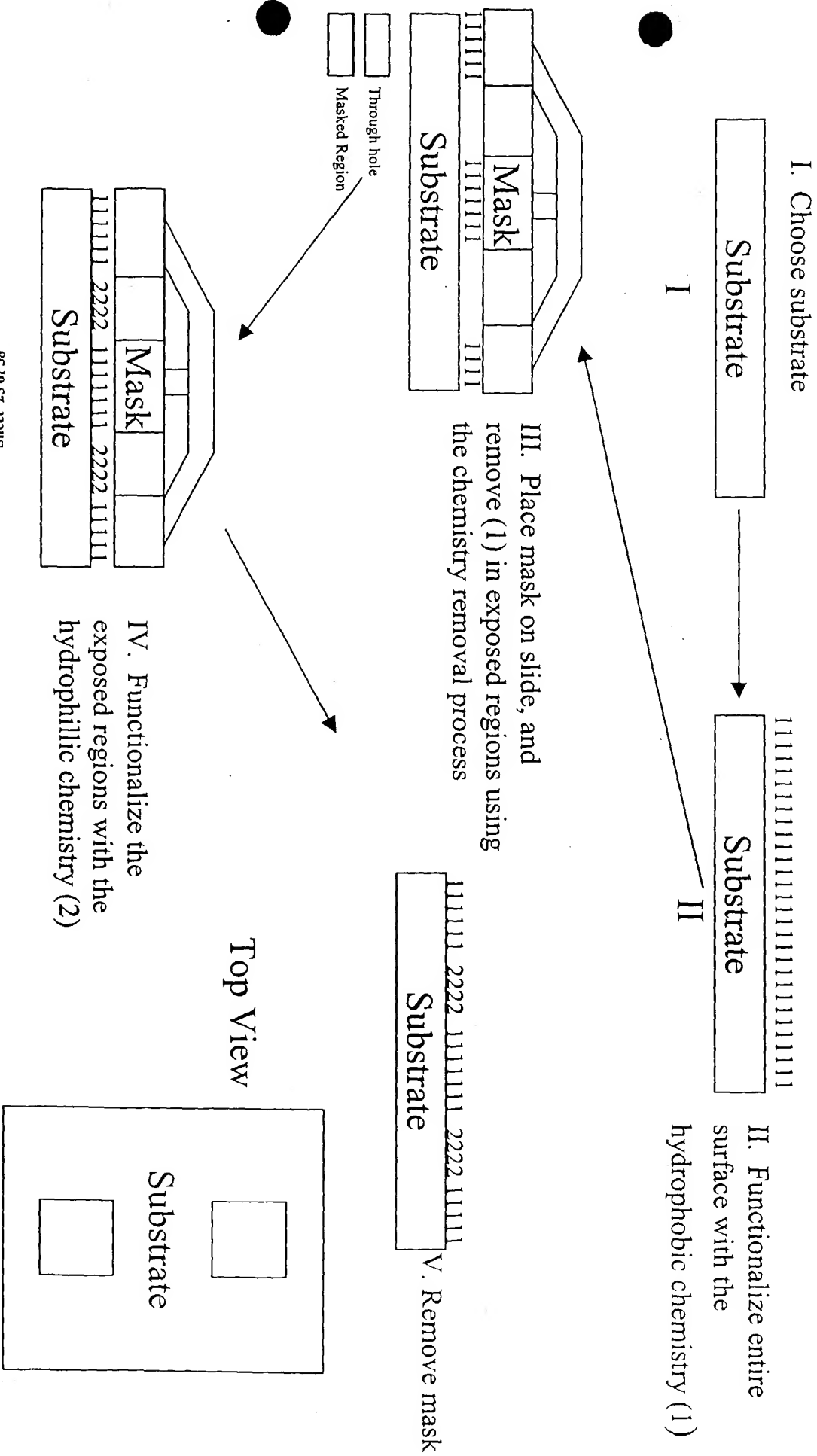


FIG. 22C



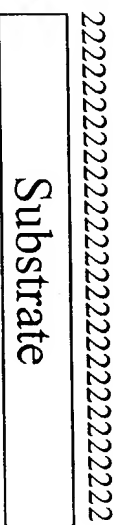
# Figure 23 Process for fabrication using a negative mask



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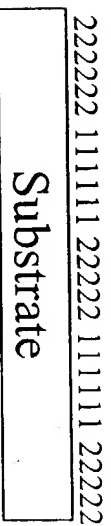
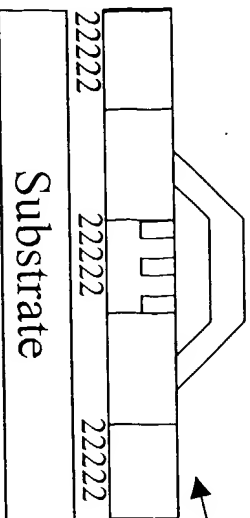
# Figure 24 Process for the fabrication using positive mask

I. Choose substrate

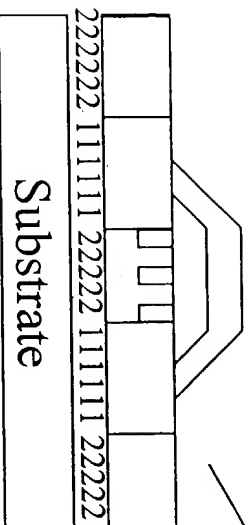


II. Functionalize with hydrophilic chemistry (2)

III. Place mask on slide, and remove (2) in exposed regions using the chemistry removal process

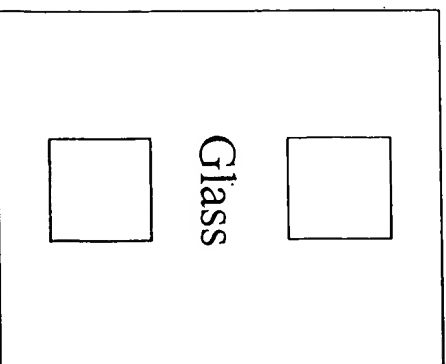


V. Remove mask



IV. Functionalize the exposed regions with the hydrophobic chemistry (1)

Top View

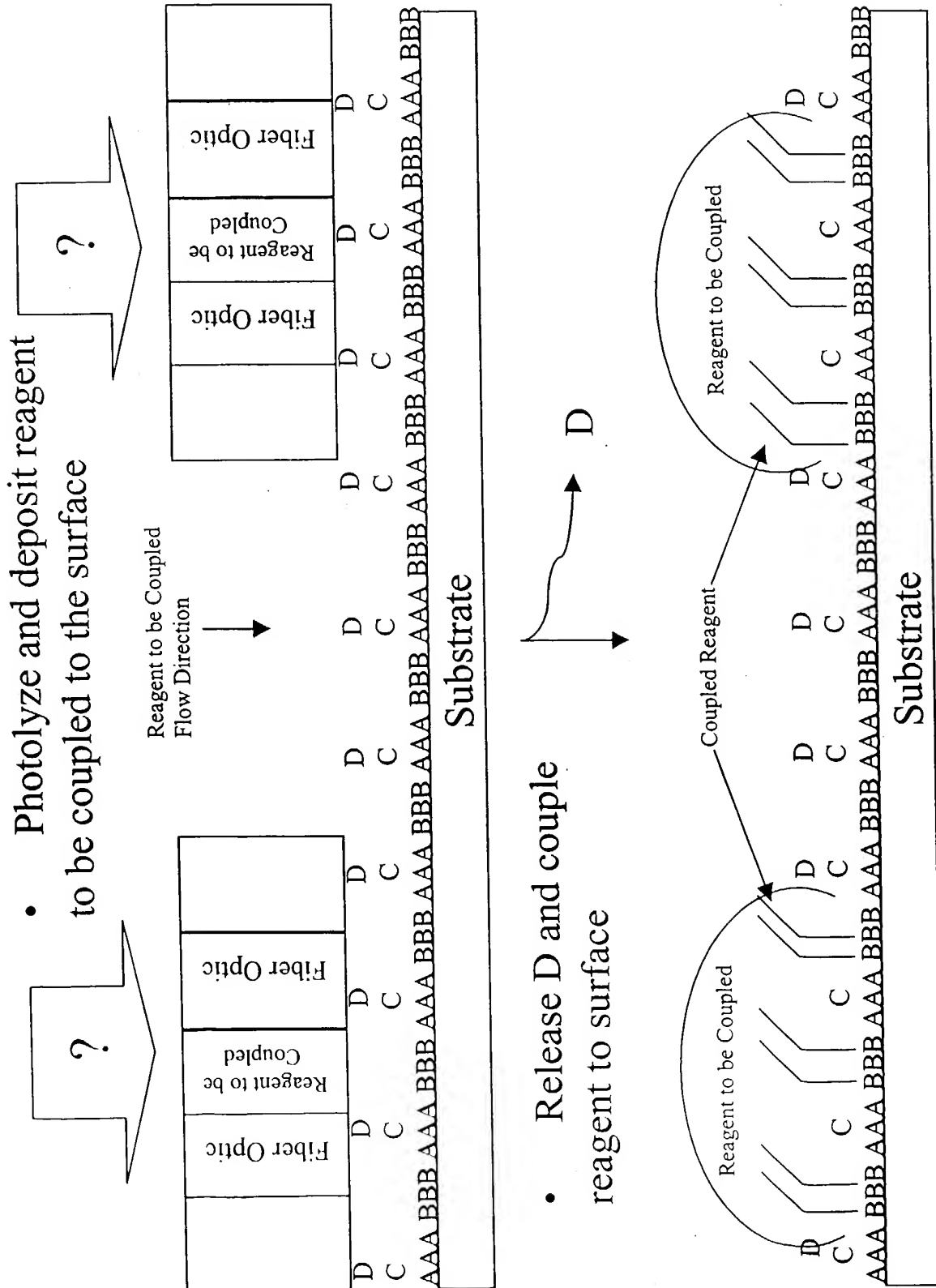


The diagram illustrates a DNA microarray setup. A horizontal bar represents the **Substrate**, which is divided into **Region 1** and **Region 2**. Above the substrate, two ovals represent **Complex mixture 1** and **Complex mixture 2**. Inside these ovals, **DNA Strands** are shown as lines with hooks, labeled with '1' and '2' sequences. A black dot is positioned above Region 1. The DNA strands are labeled with '1' and '2' sequences.

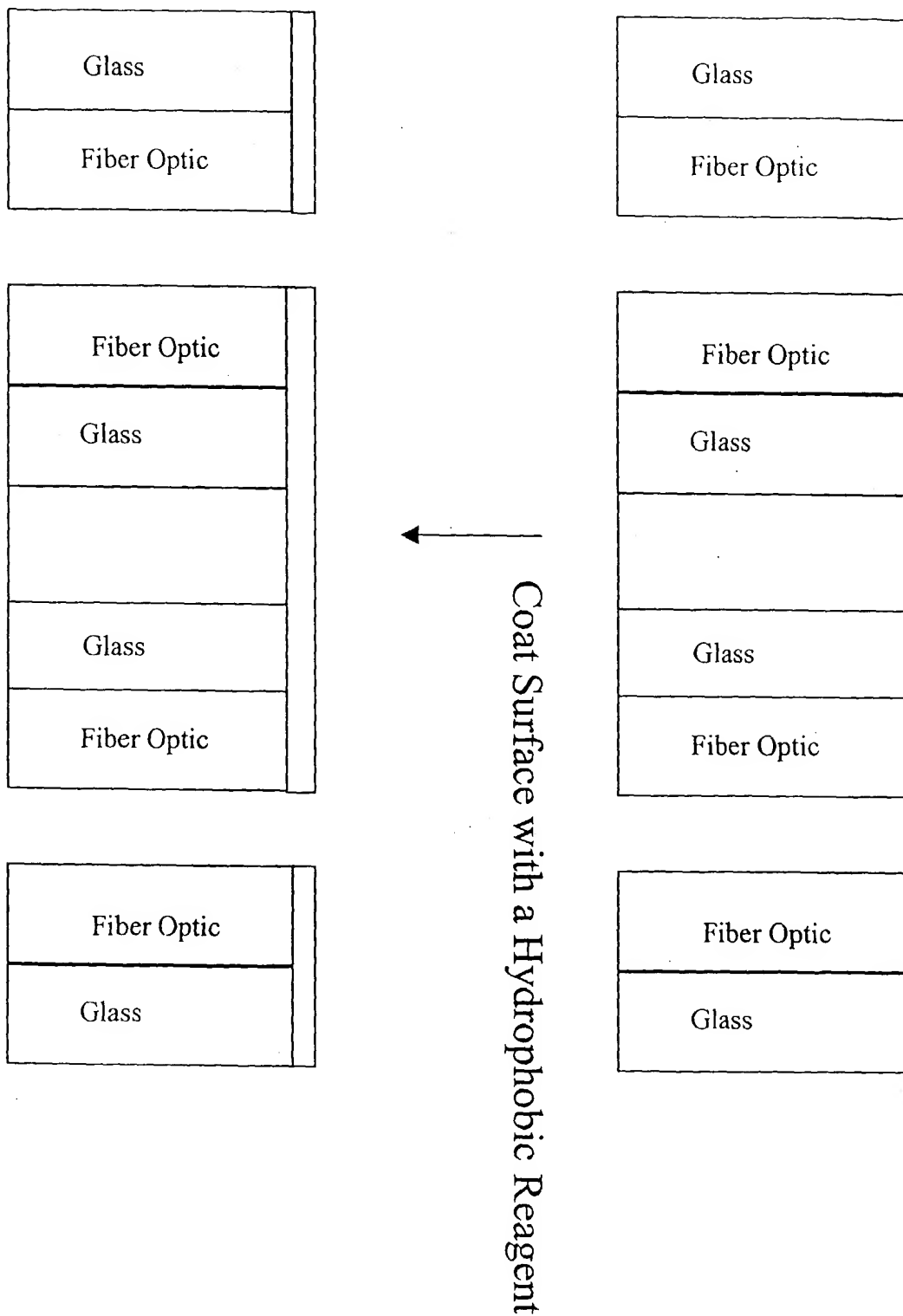


[illegible]

**Figure 26B Surface Tension Patterning: On-capillary Fiber optic based patterning**



**Figure 27A Volume Metering using Surface Tension Features**



**Figure 27B Volume Metering using Surface Tension Features**

Place a Mask on to the Surface and Expose the Surface to the Chemistry Removal Process

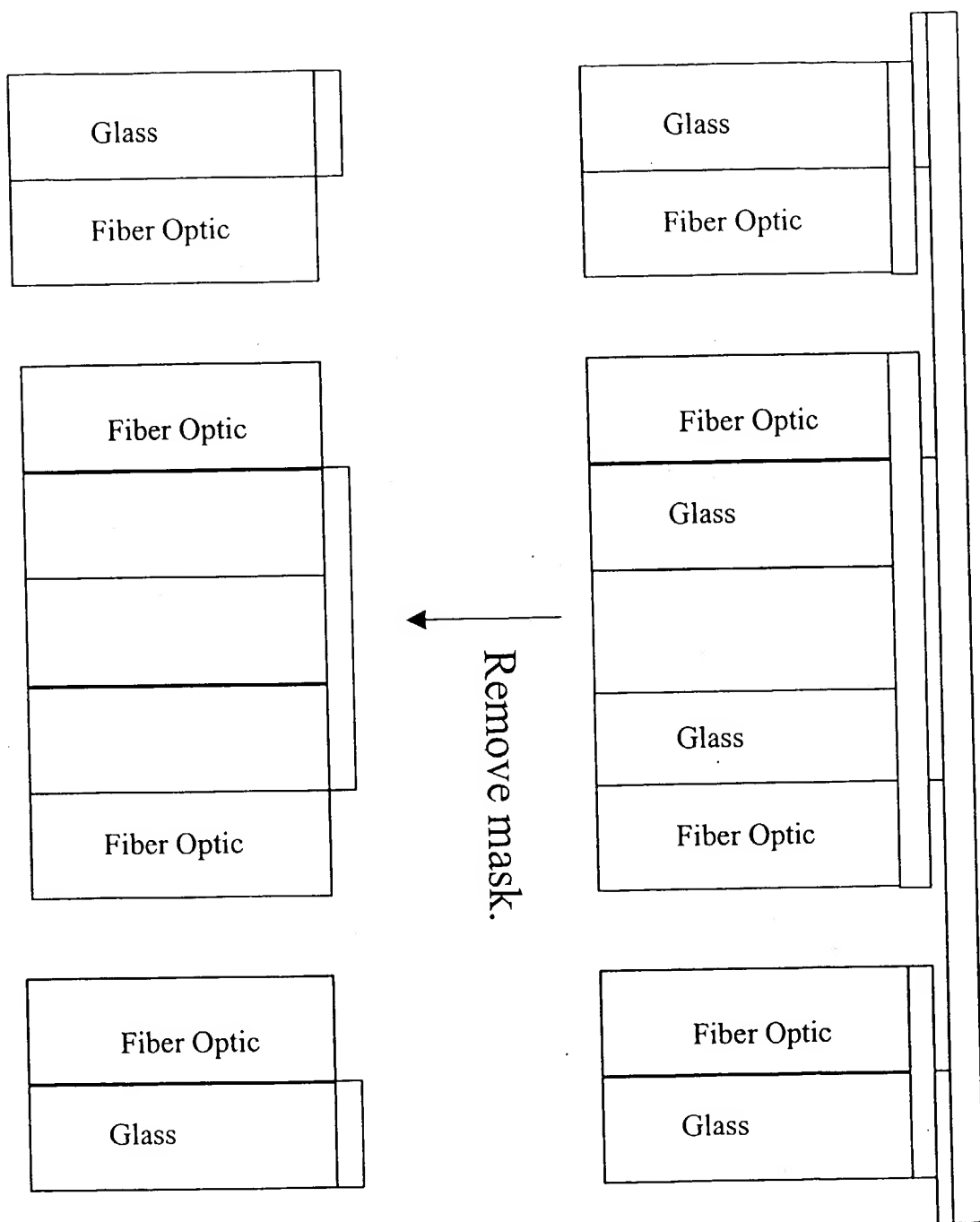
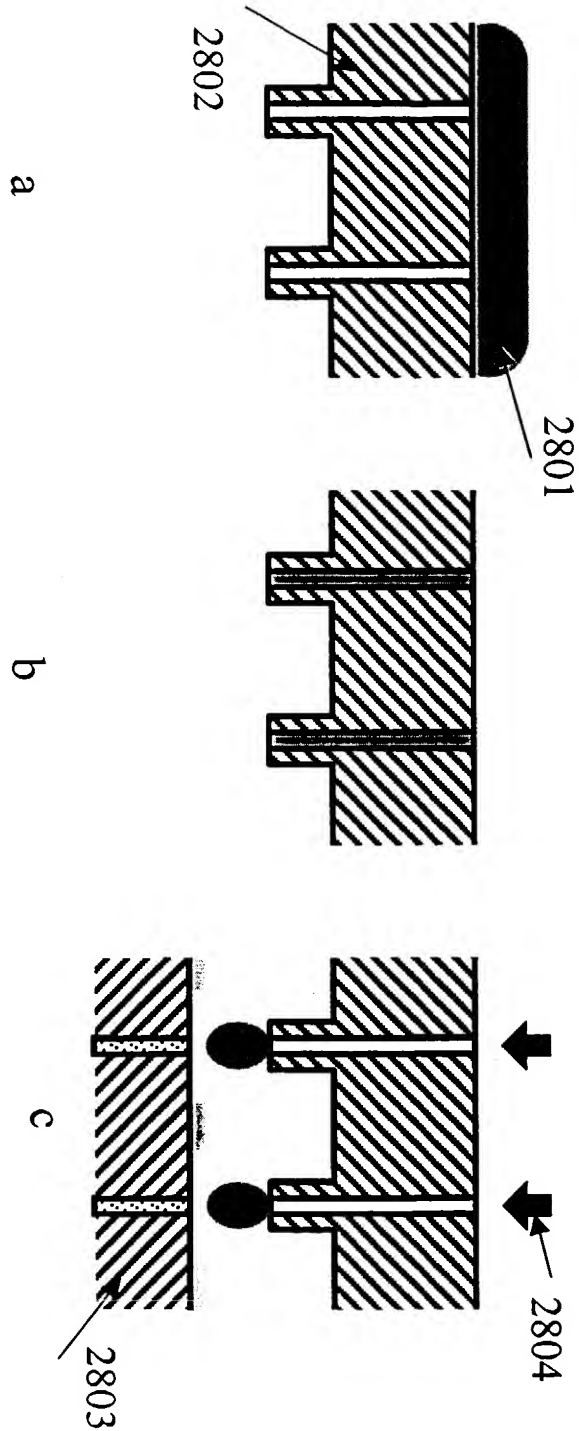


Fig. 28 Reagent pre-metering using an intermediary through-hole array



2801 - reagent fluid applied in excessive;  
 2802 - intermediary through hole array;  
 2803 - capillary array compound library;  
 2804 - pressure



Fig. 29 Metering and mixing with a multi-use capillary array  
compound library

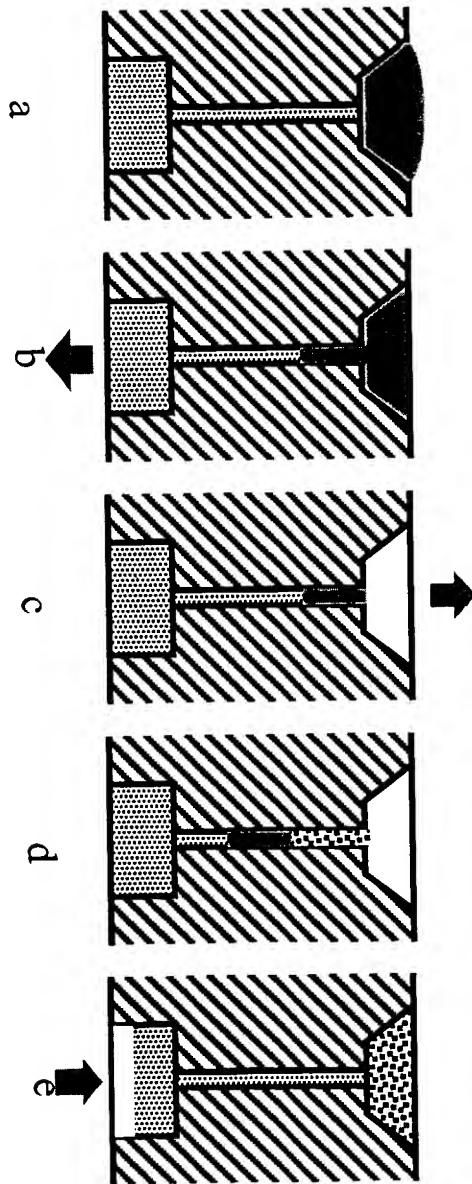


Fig. 30 Metering with hydrophilic patch and mixing

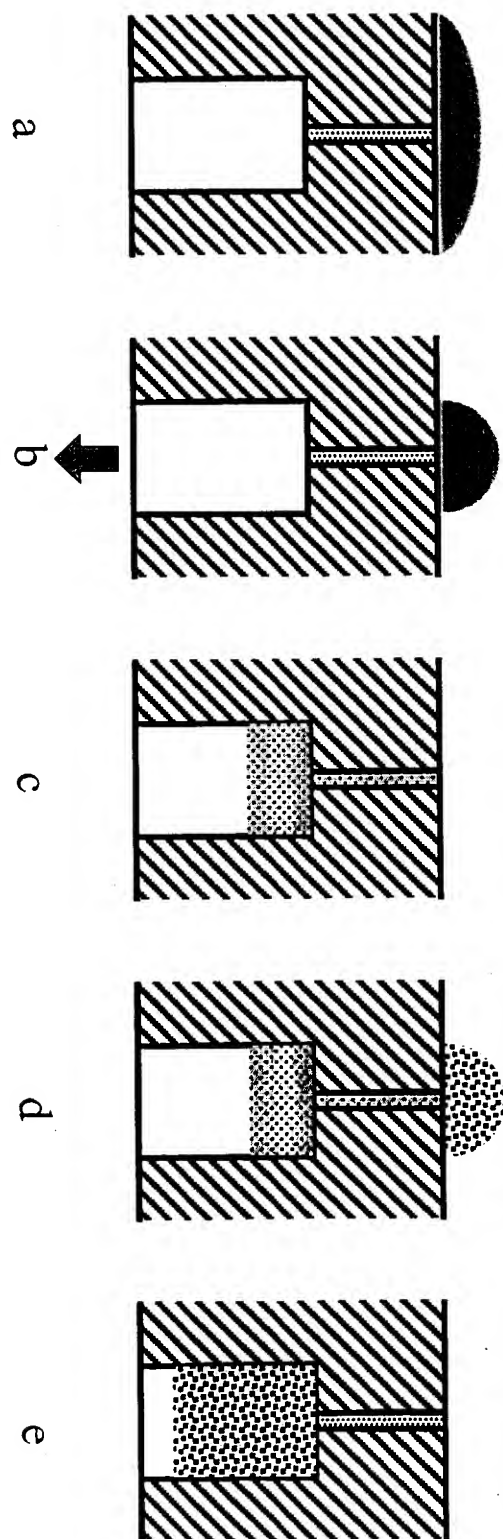


Fig. 31 Mixing and metering with interconnected chambers

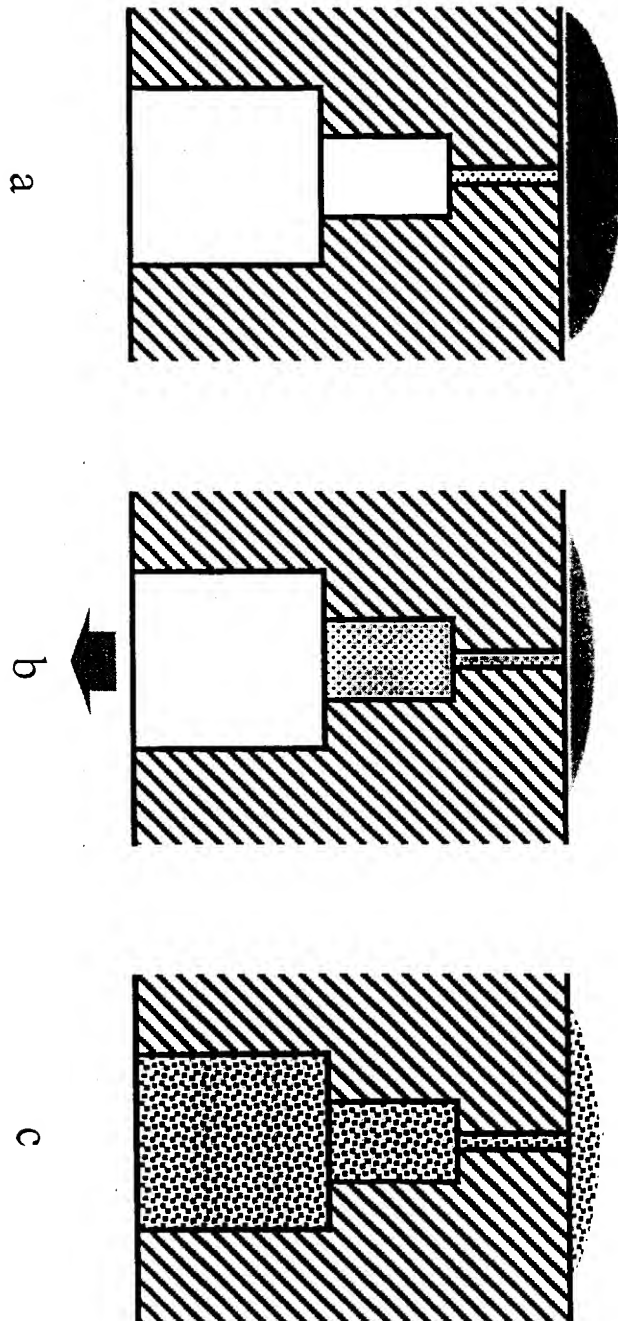
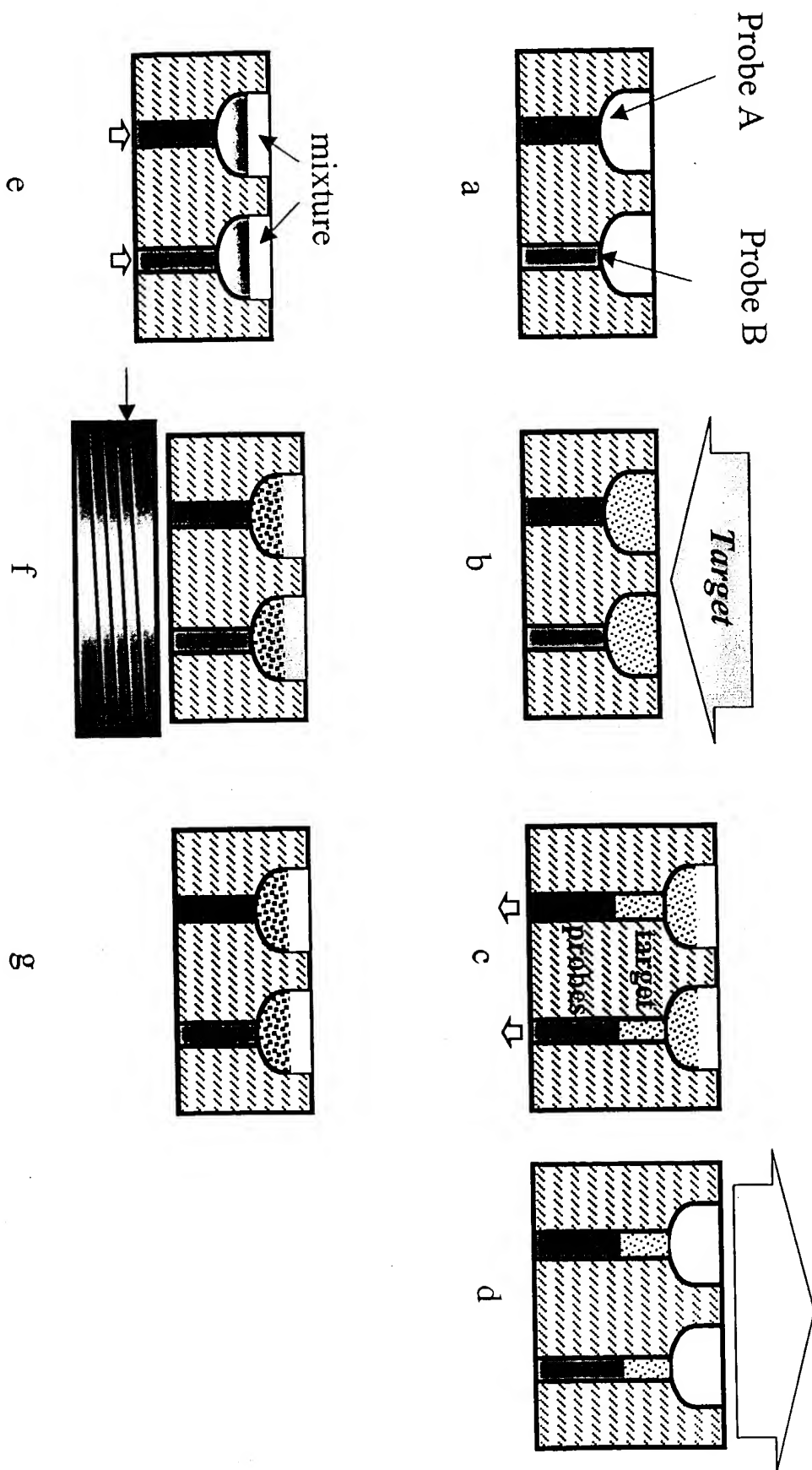


Fig. 32 Heterogeneous Assay

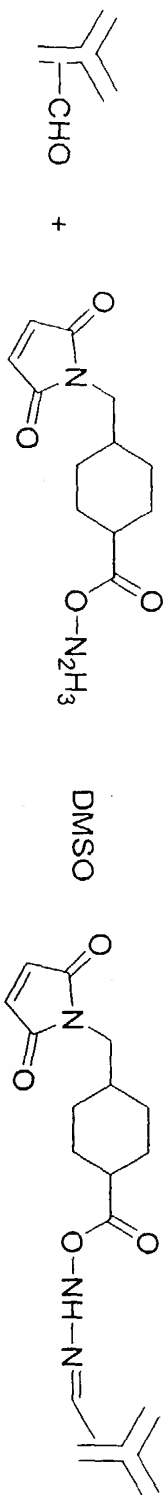


# Antibody Immobilization via the Carbohydrate Moiety

1. Oxidation of antibodies vicinal diol group to its aldehyde



2. Conjugation of maleimide moiety with antibody



3. Immobilization of the modified antibody to the surface.

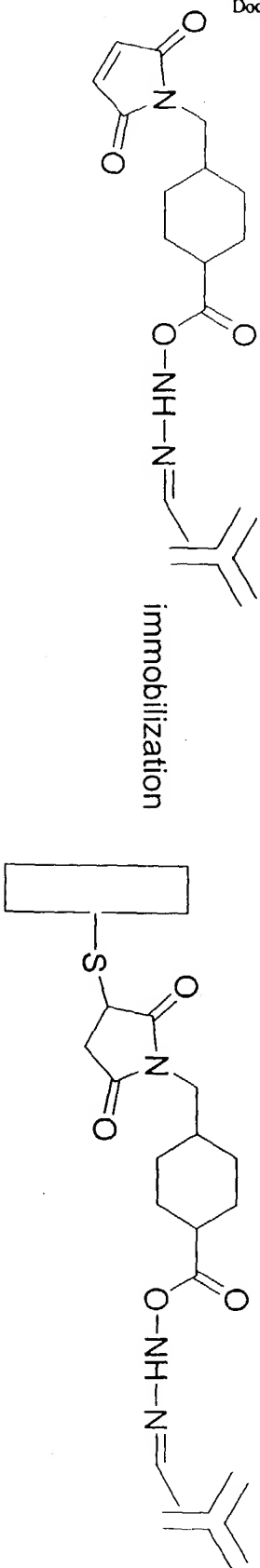
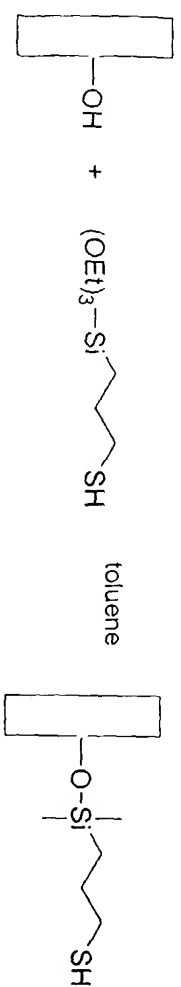


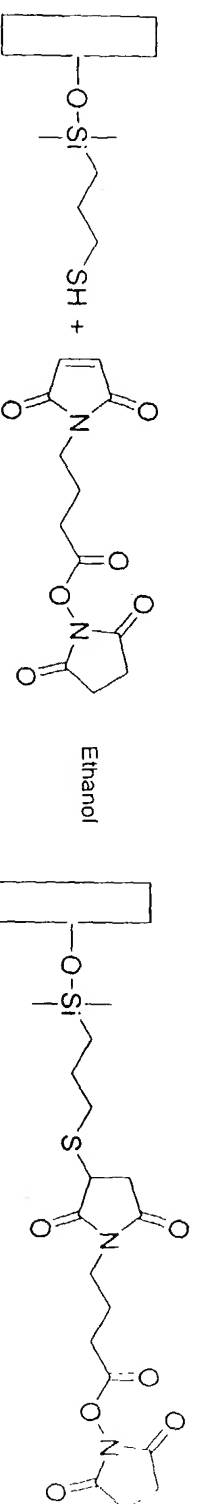
FIG. 33A

# Immobilization via Amine Groups

1. Hydrosilylation of (3-mercaptopropyl)triethoxysilane on the surface of fiber



2. Formation of a thioether bond



3. Attachment of fiber to antibody

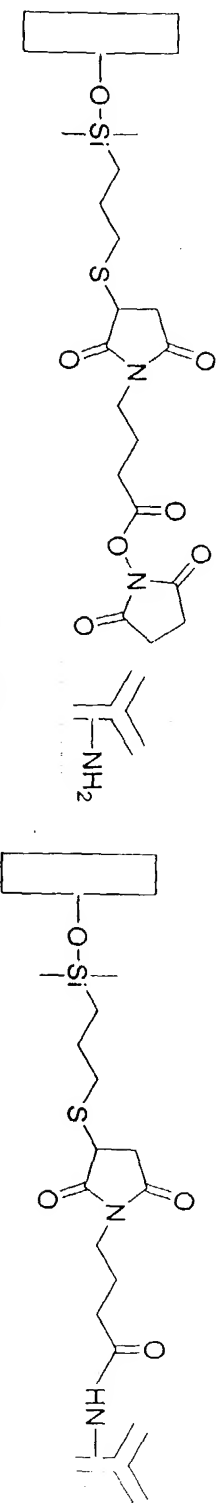
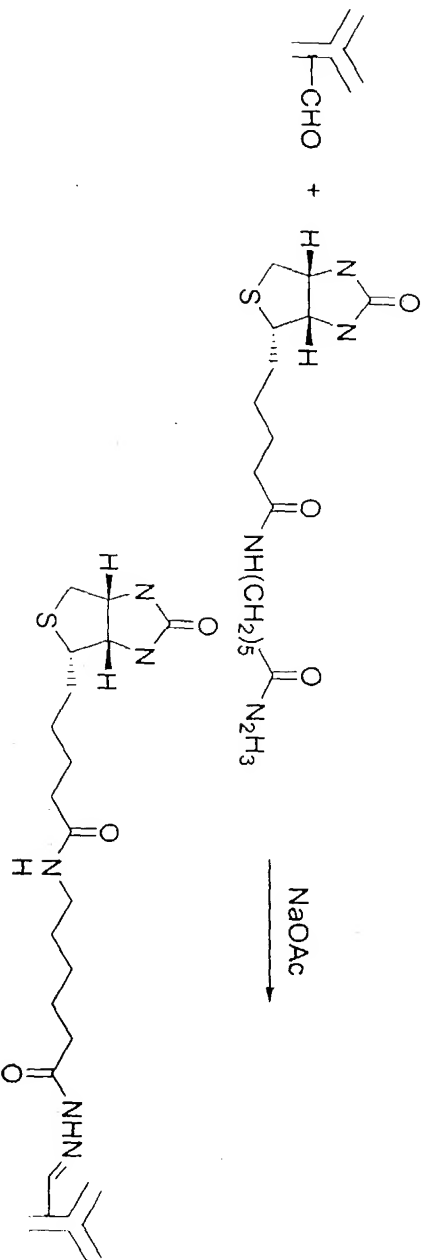


FIG 33B

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# Antibody Immobilization via Streptavidin

## 1. Label antibody with biotin



## 2. Modification of fiber surface with biotin maleimide

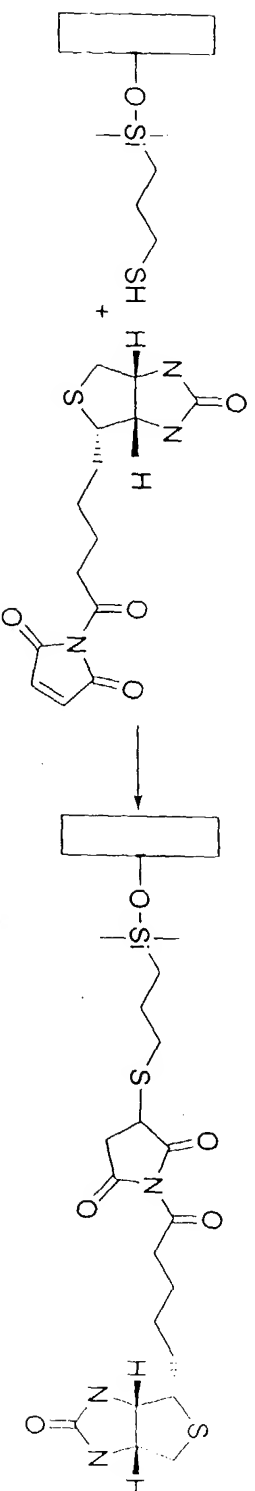
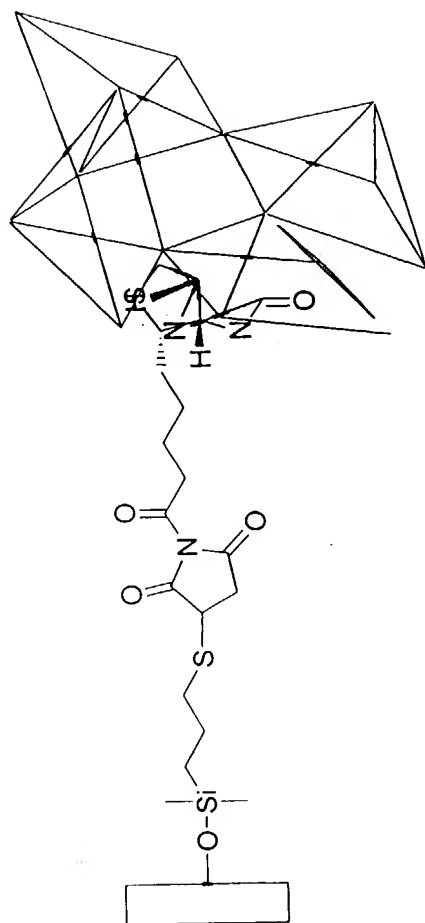


FIG 33c

# Antibody Immobilization via Streptavidin

3. Conjugate Streptavidin to the surface



4. Conjugate Biotin Antibody to the surface

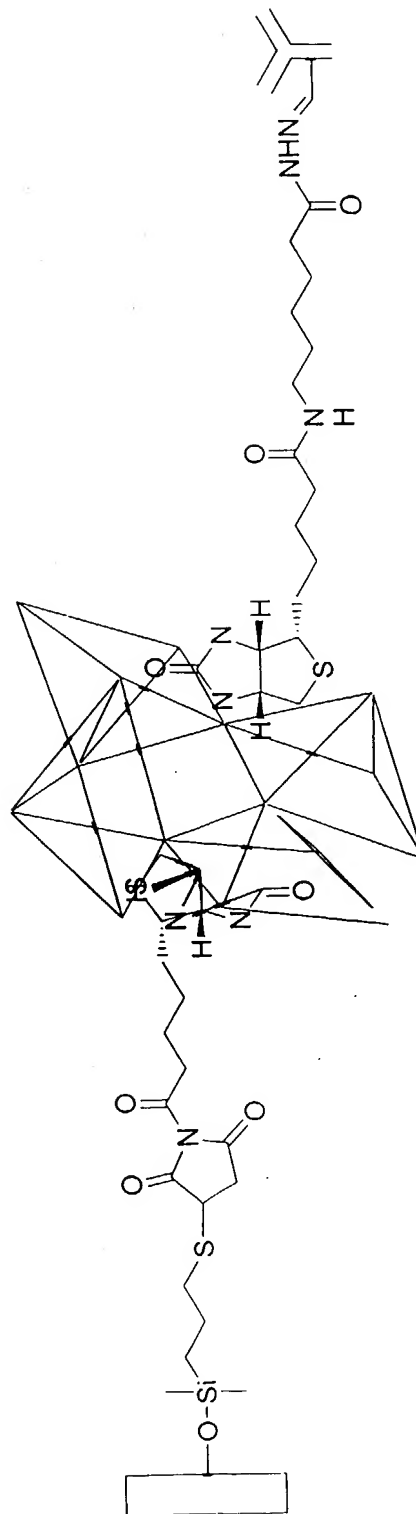
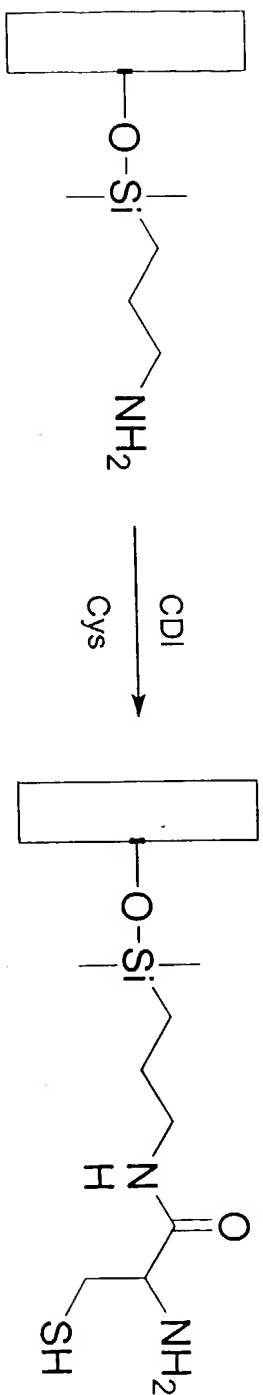


FIG. 33D



# Formation of thiazolidine

## 1. Surface attachment and formation of the linker



## 2. Thiazolidine formation

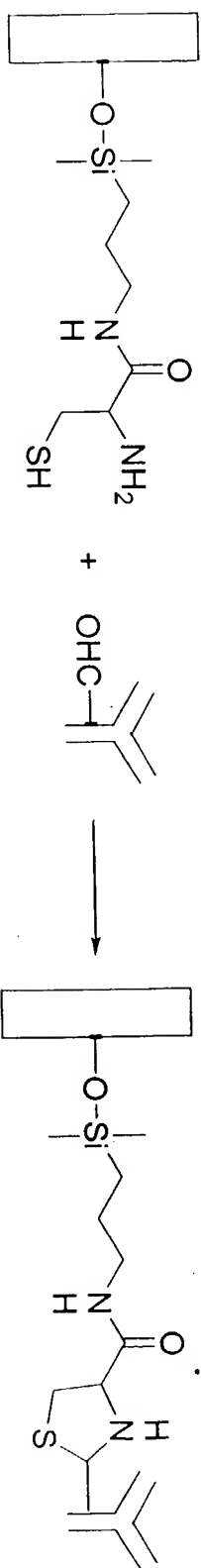
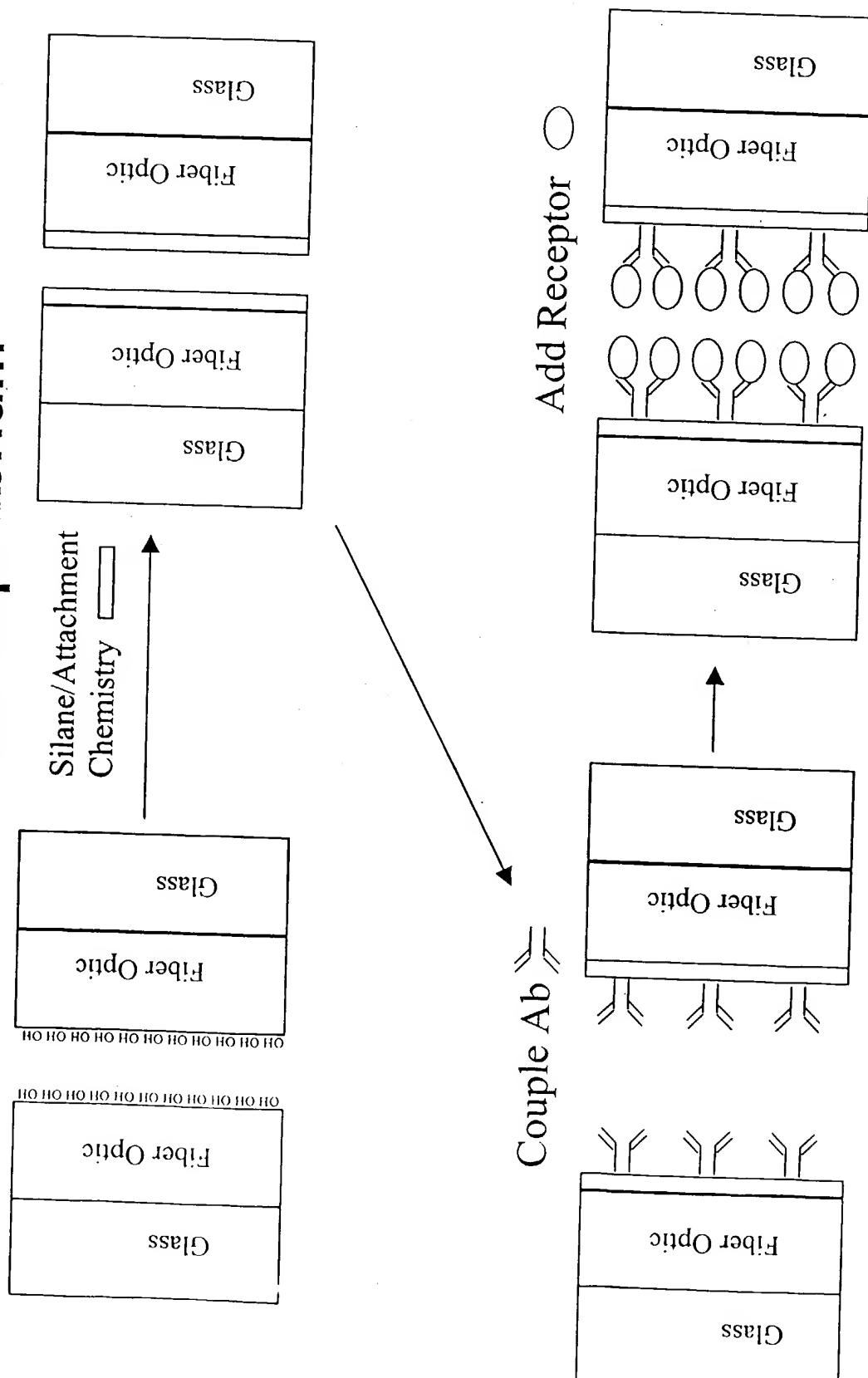
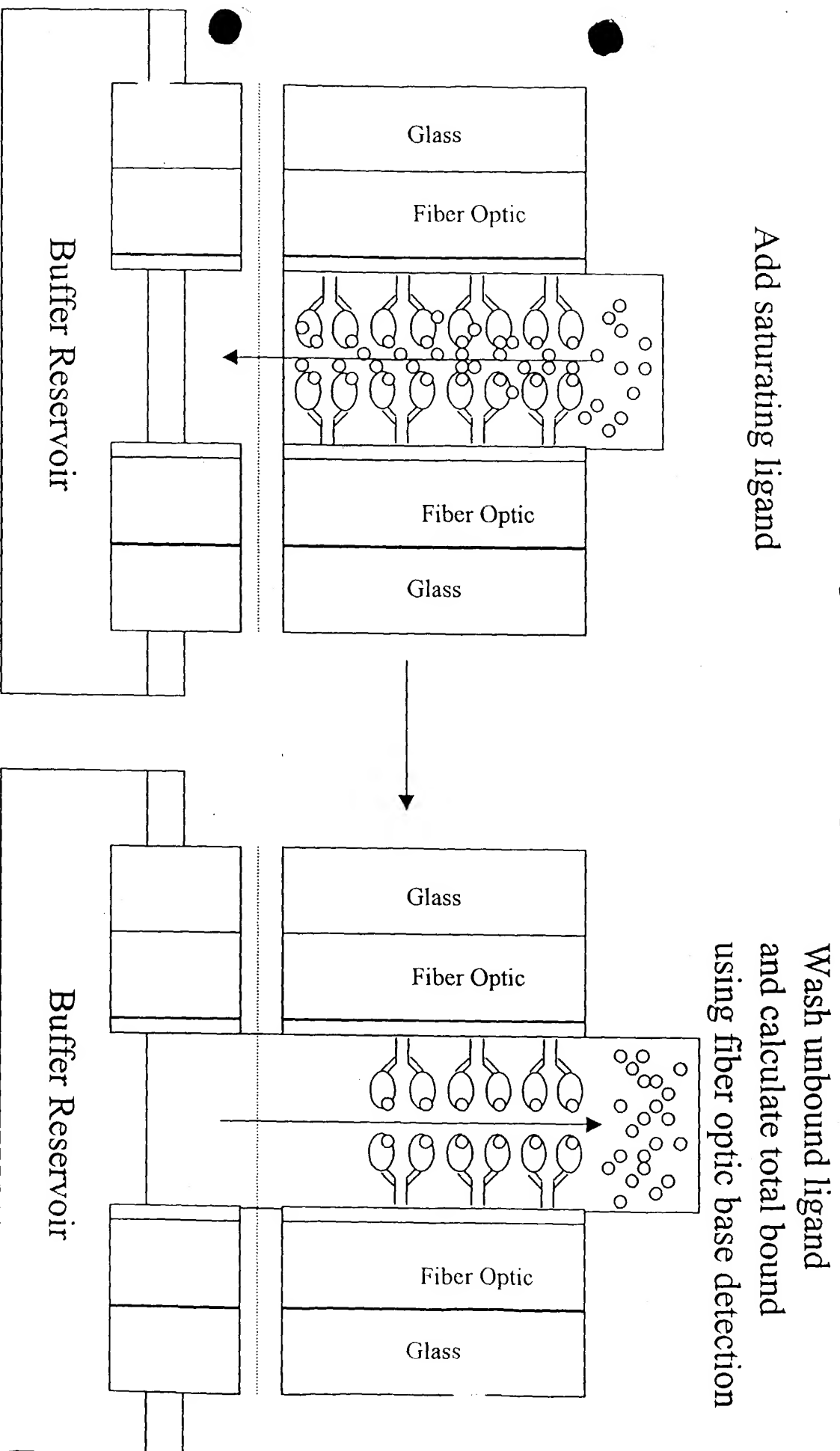


FIG. 33E

**Figure 34 Capillary Based Receptor Binding Assay:  
Non-equilibrium**



# Figure 34 (cont. 1). Capillary Based Receptor Binding Assay: Non-equilibrium

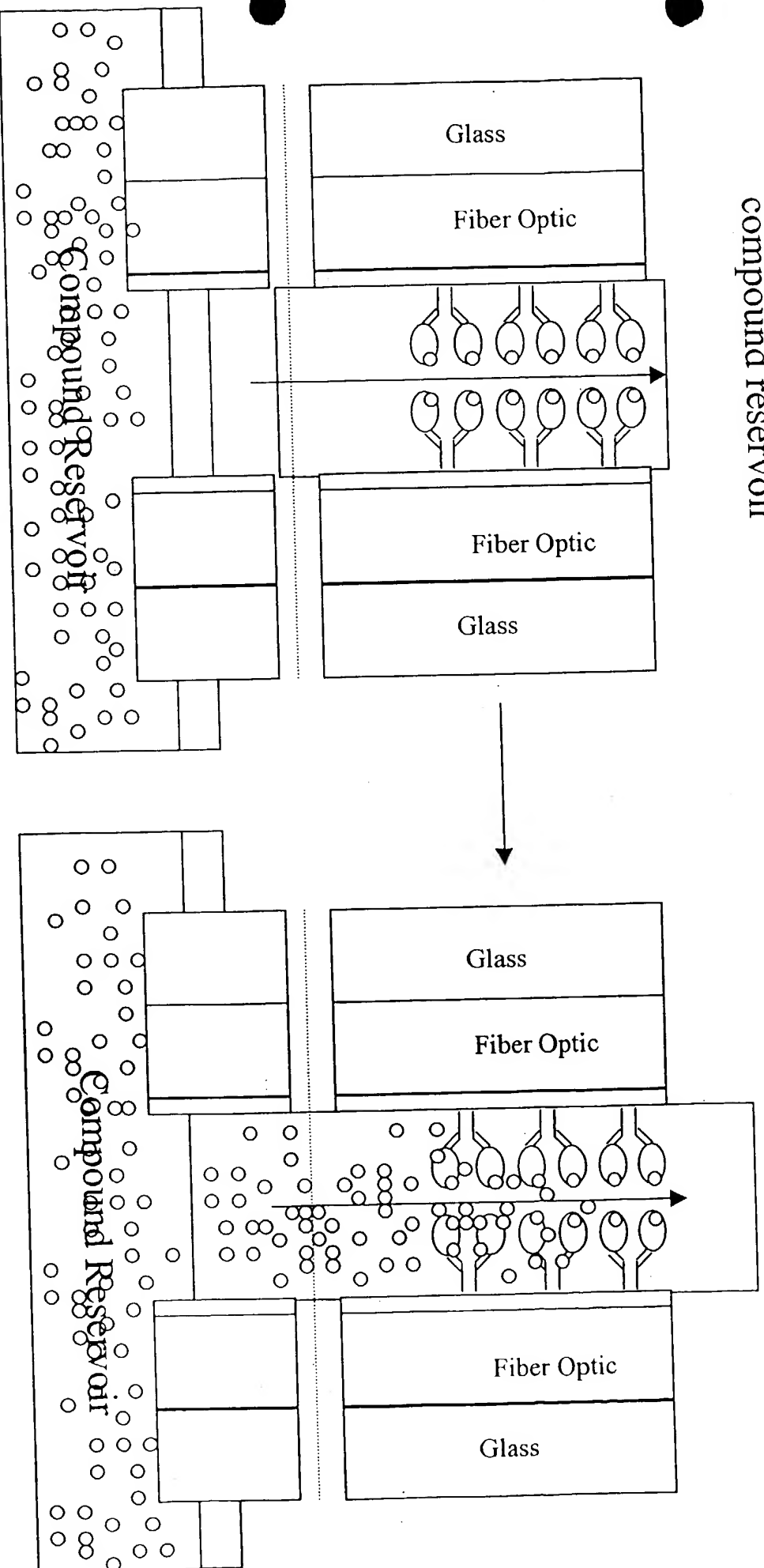


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# Figure 34 (cont. 2). Capillary Based Receptor Binding Assay: Non-equilibrium

Move capillary to compound reservoir

Add compound and use fiber optic based detection to observe kinetics

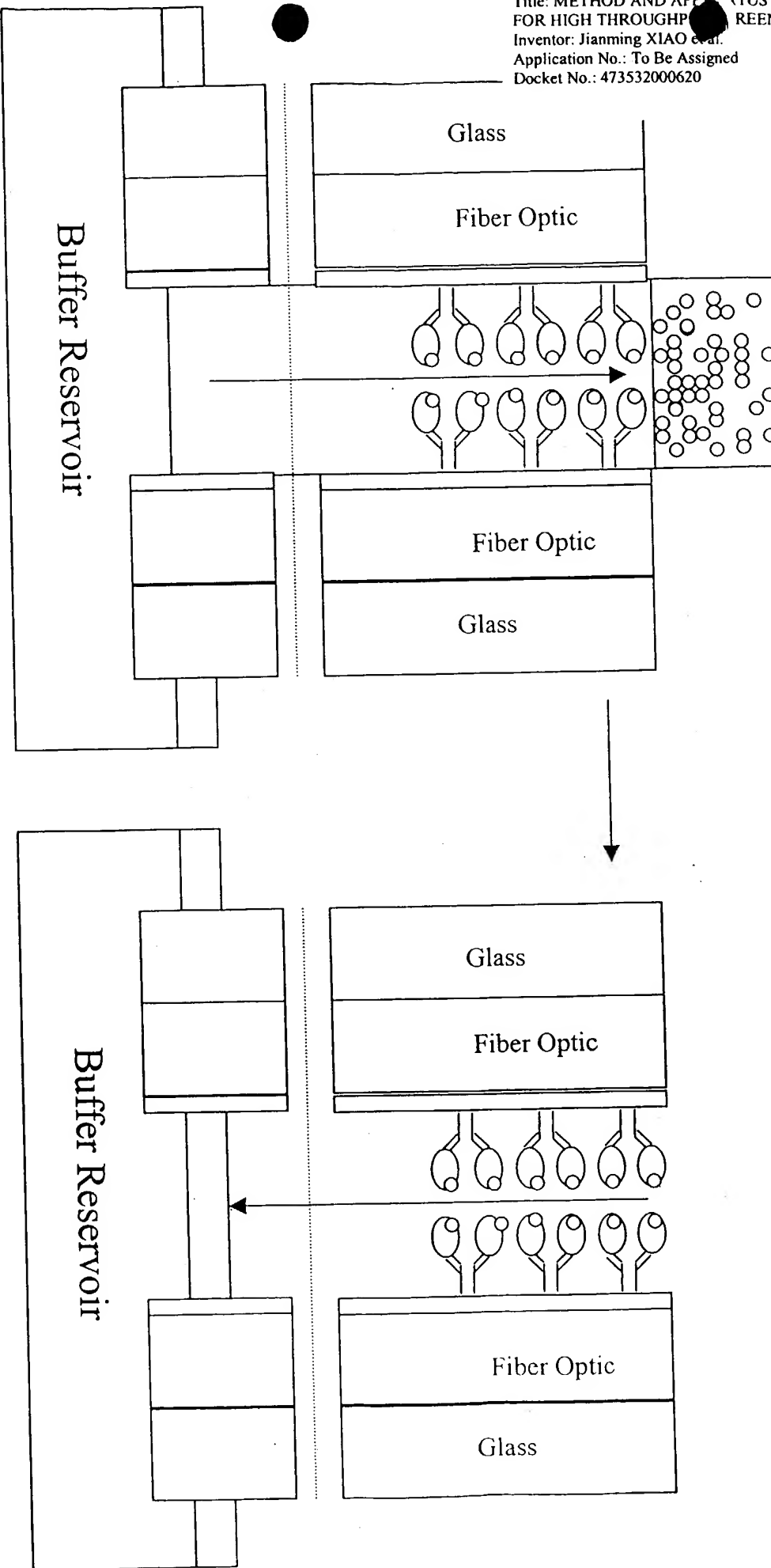


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# Figure 34 (cont. 3). Capillary Based Receptor Binding Assay: Non-equilibrium

Mover capillary to buffer reservoir and wash

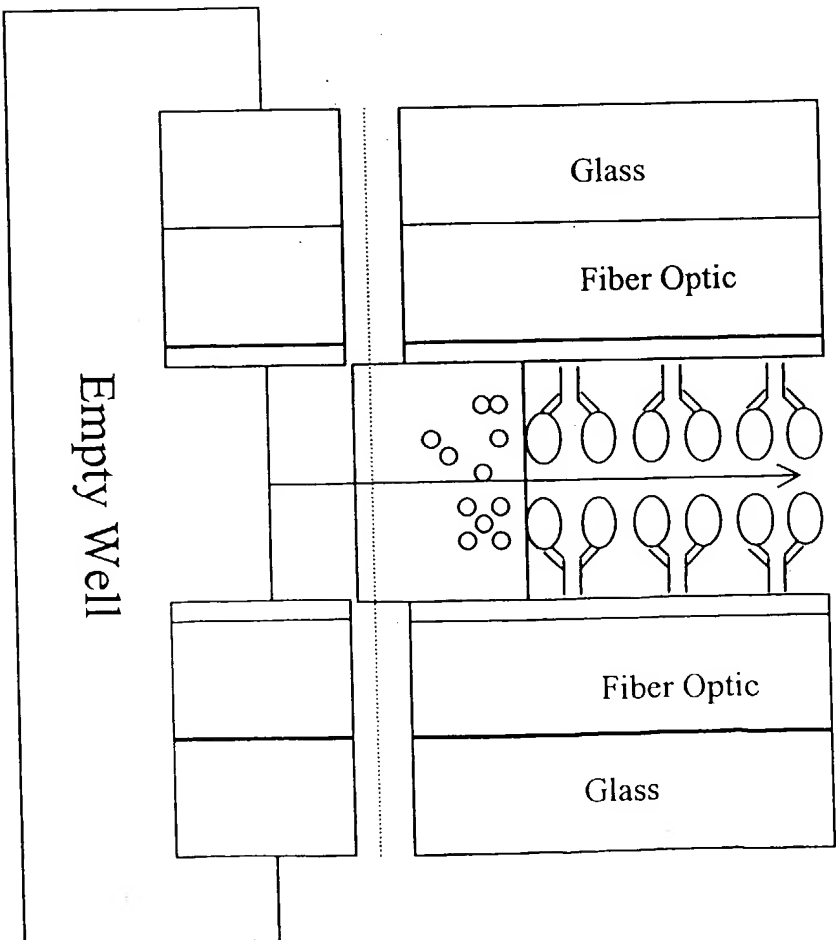
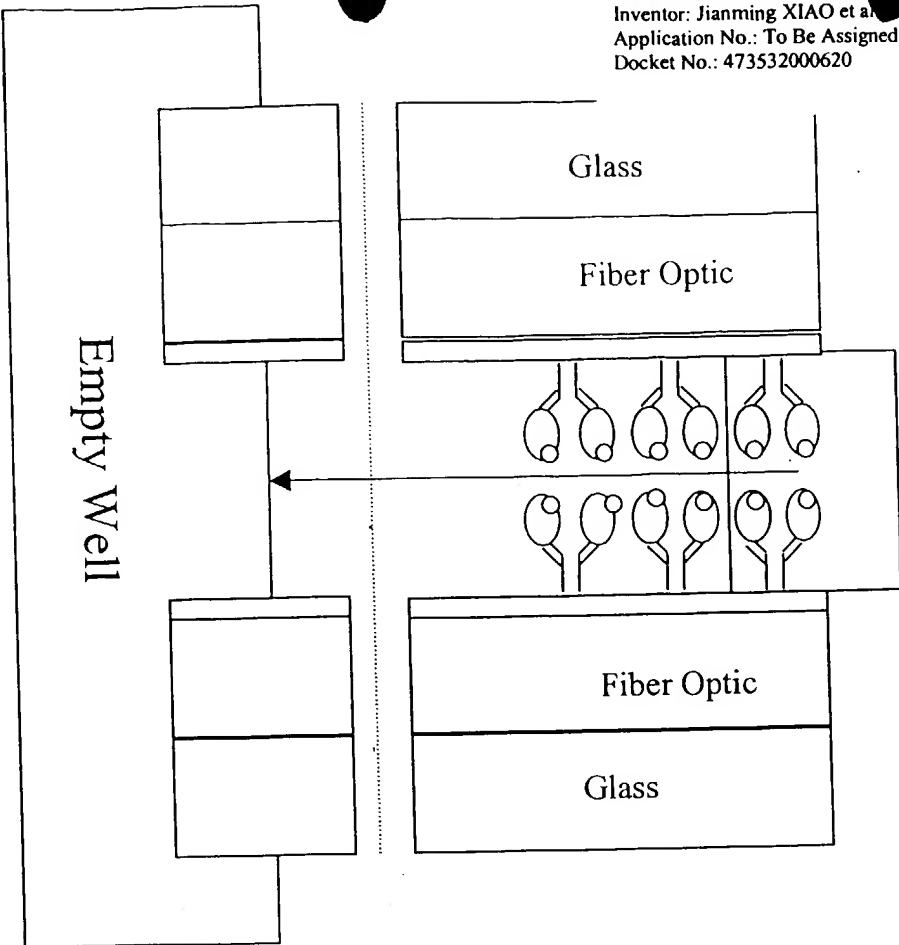
Dry capillary



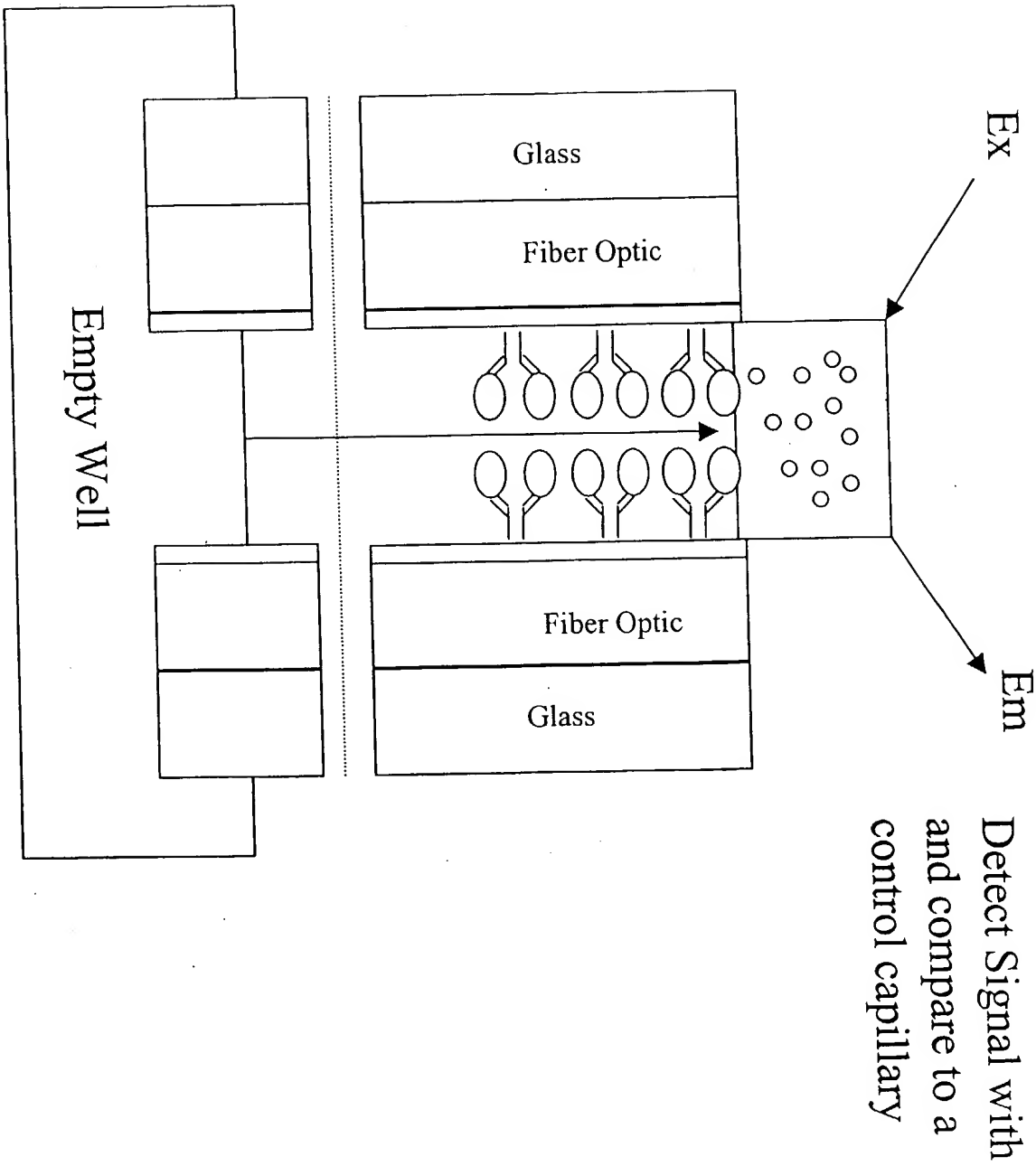
# Figure 34 (cont. 4). Capillary Based Receptor Binding Assay: Non-equilibrium

Push an acid plug or detect  
 % bound using fiber optic  
 based detection

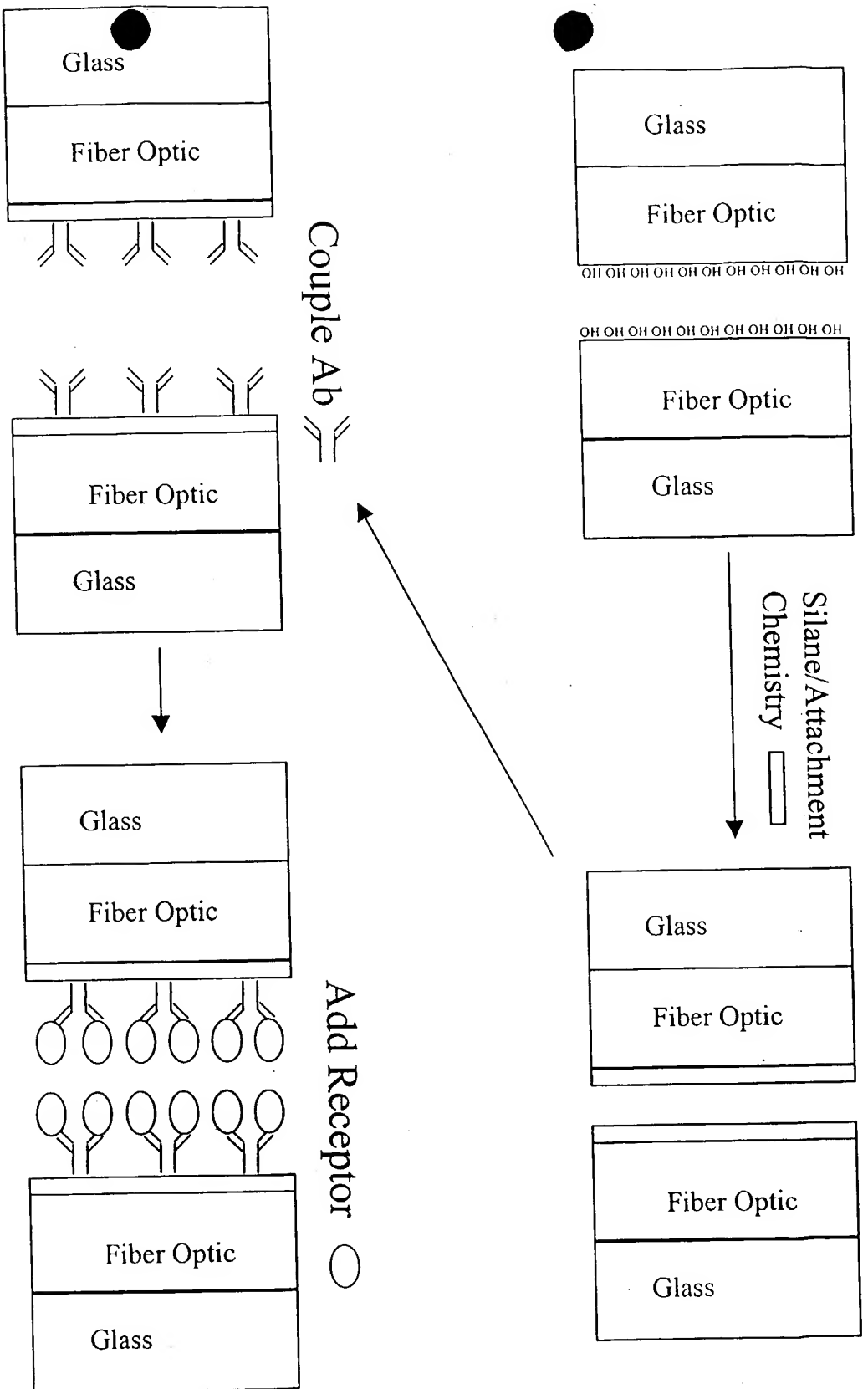
Apply vacuum  
 after plug travels  
 down capillary



# Figure 34 (cont. 5). Capillary Based Receptor Binding Assay: non-equilibrium



**Figure 35 Capillary Based Receptor Binding Assay: Equilibrium**

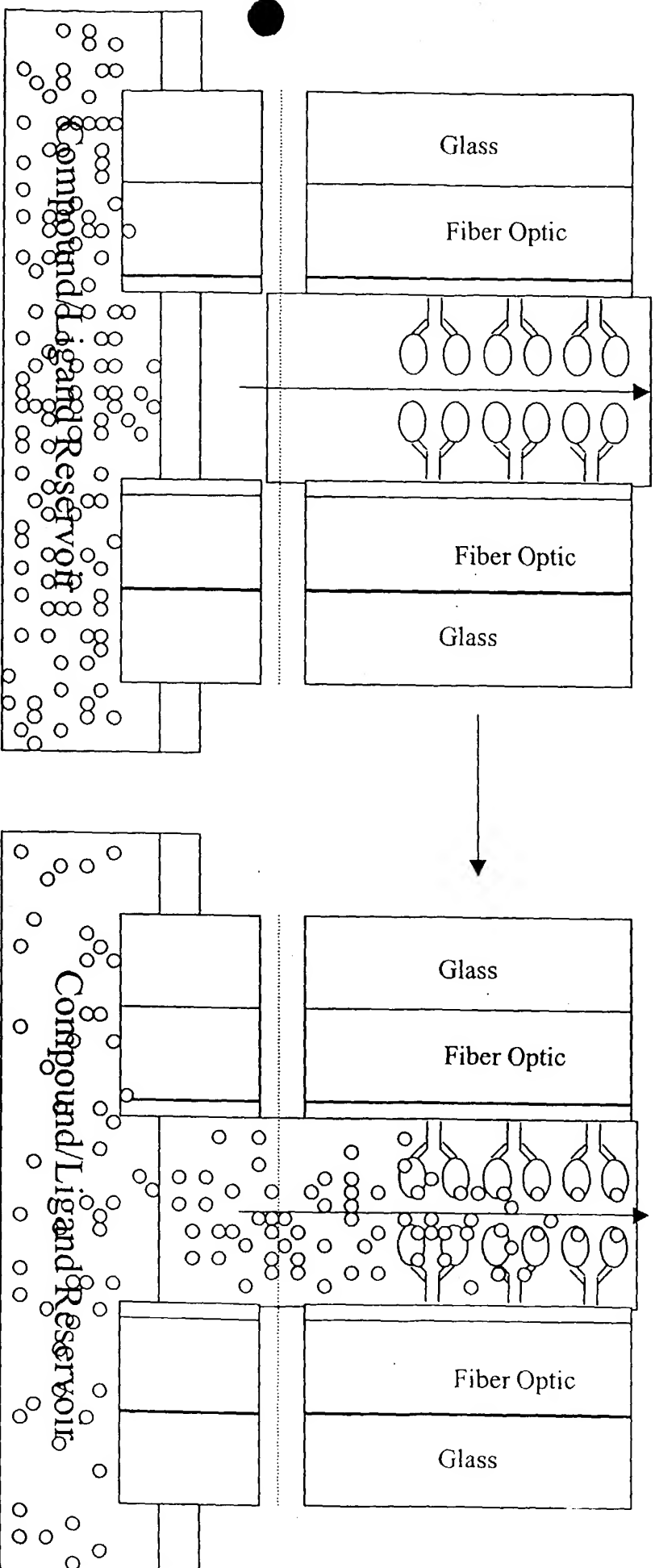




# Figure 35 (cont. 1). Capillary Based Receptor Binding Assay: Equilibrium

Move Capillary to compound/ligand reservoir.

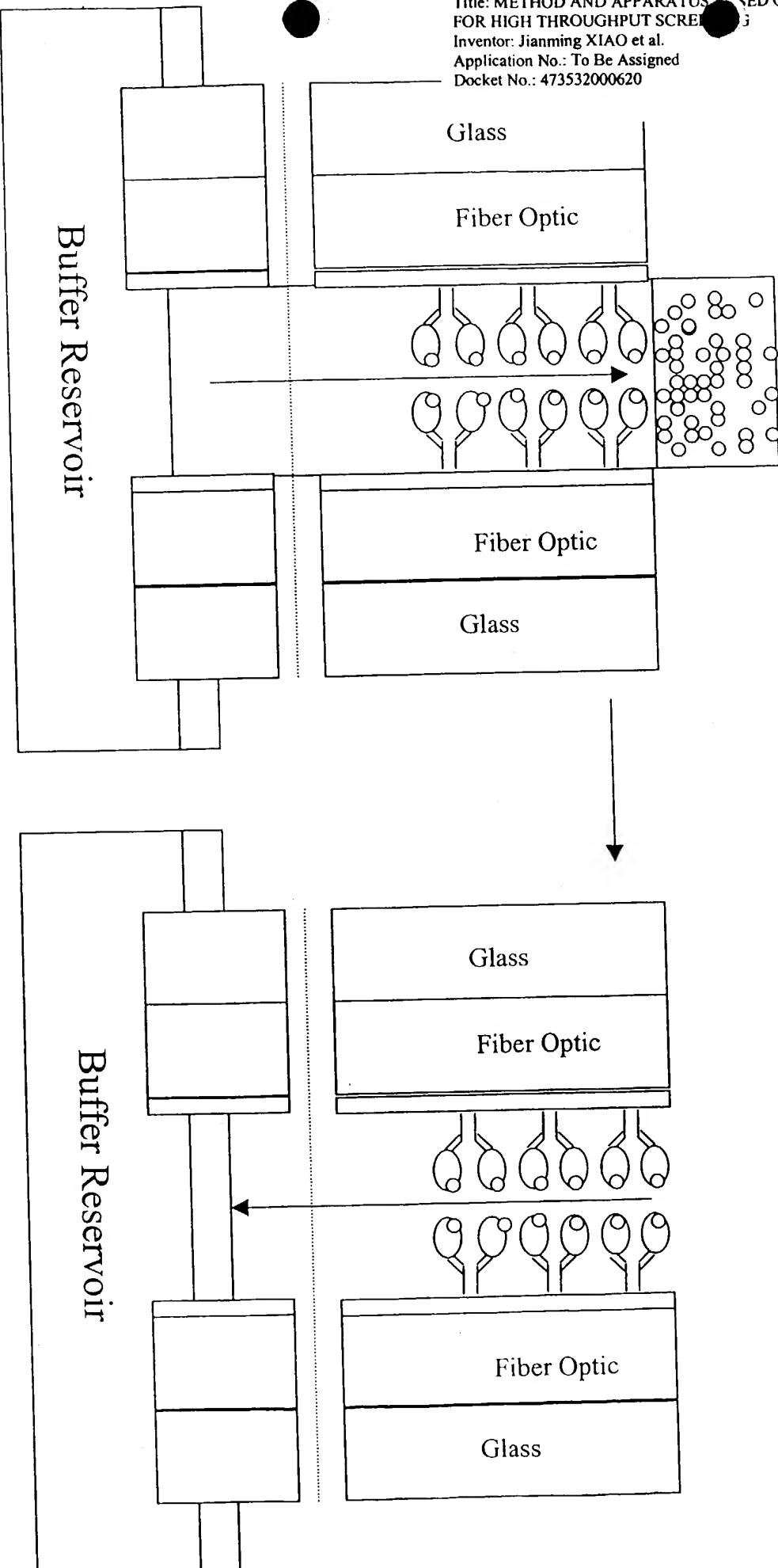
Add solution and let system reach equilibrium. Detect equilibrium using fiber optic base detection.



# Figure 35 (cont. 2). Capillary Based Receptor Binding Assay: Equilibrium

Move capillary to a buffer reservoir and wash capillary with buffer. Detect % bound using fiber optic based detection.

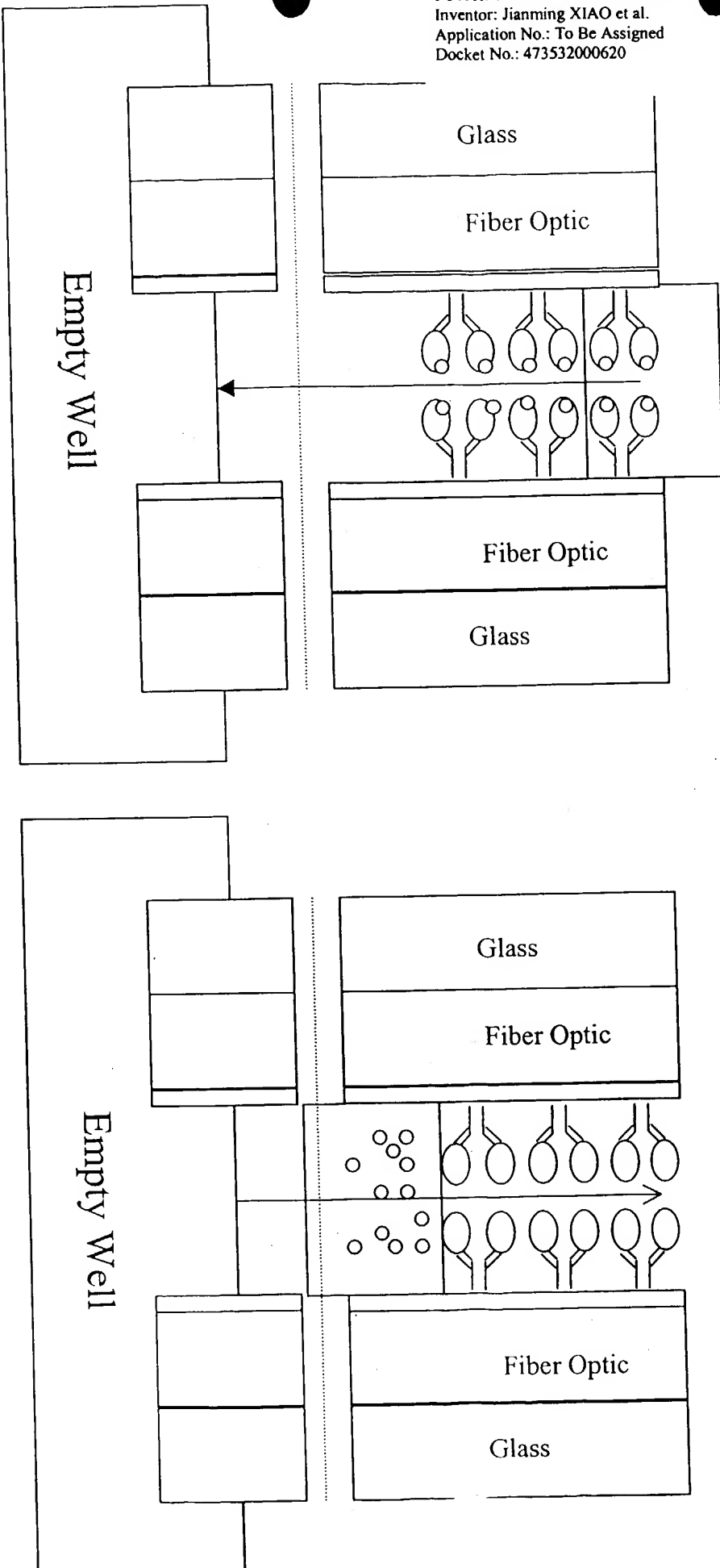
Dry Capillary



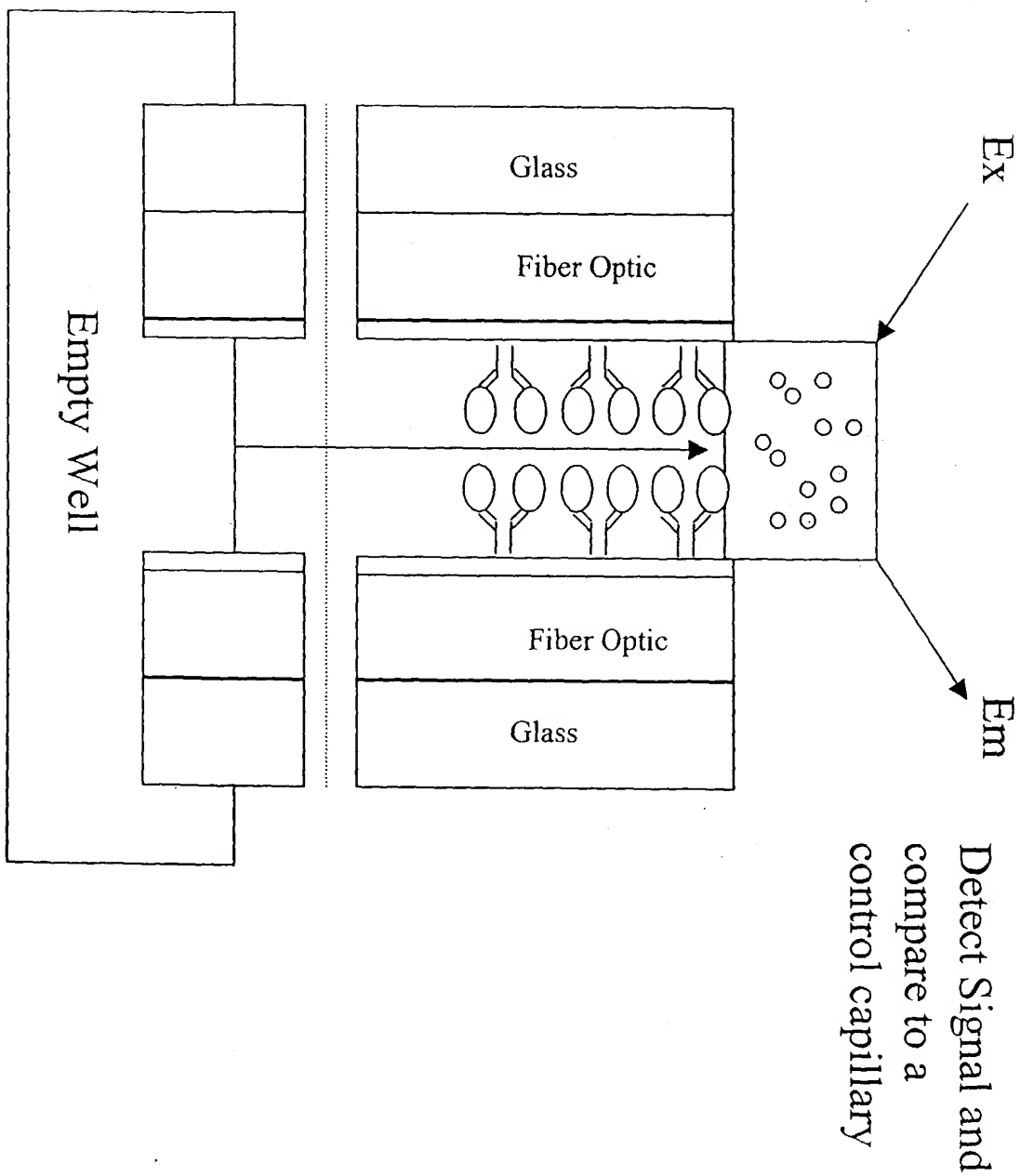
# Figure 35 (cont. 3). Capillary Based Receptor Binding Assay: Equilibrium

Detect signal using fiber optic  
 base detection or elute bound  
 ligand with acid.

Apply vacuum  
 after plug travels  
 down capillary



**Figure 35 (cont. 4). Capillary Based Receptor Binding Assay: Equilibrium**



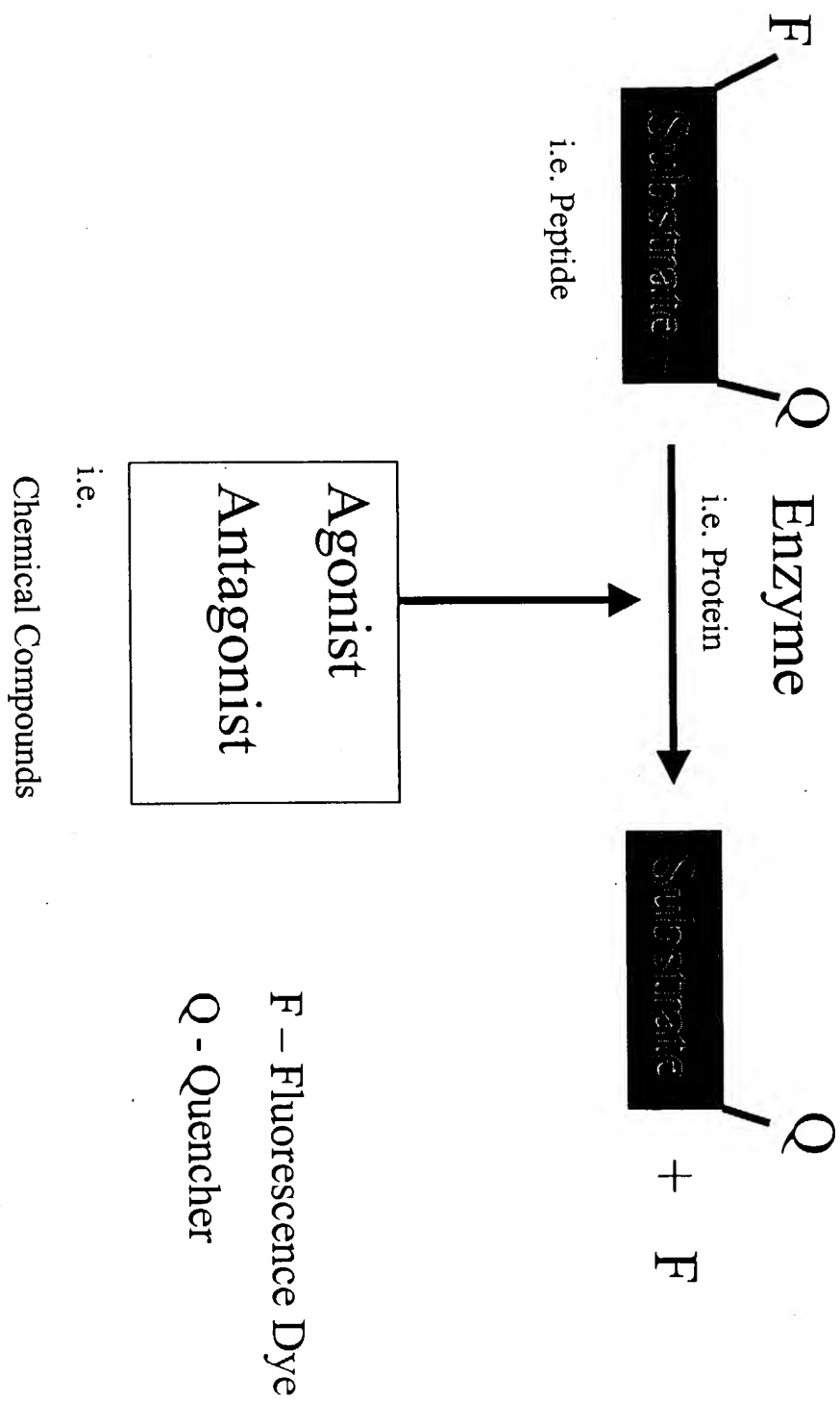
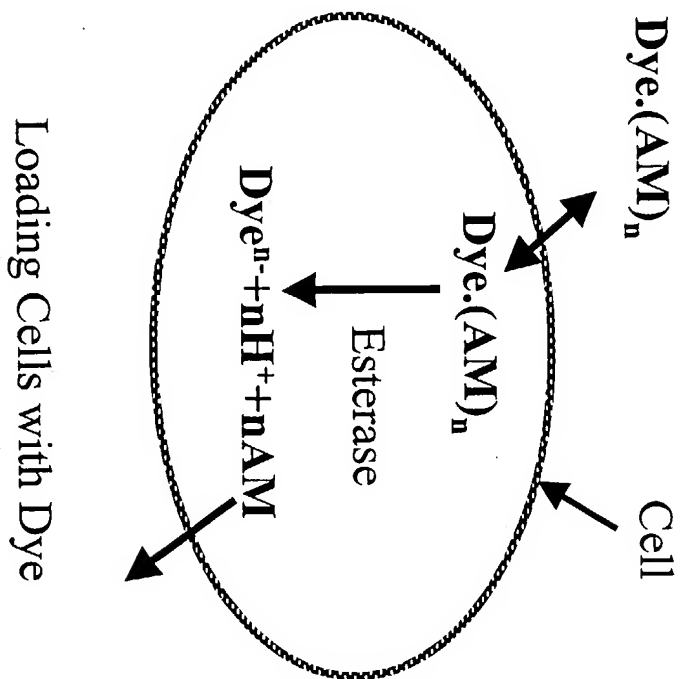


Figure 36



+  
 Agonist or  
 Antagonist

→

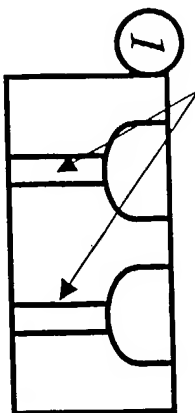
Fluorescence  
 Detection

Assay Based on Tracking Cytosolic [Ca<sup>++</sup>]

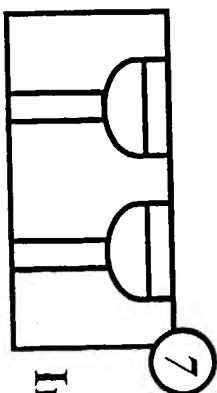
Figure 37

# Protein Array & Cell Array

Library of antigen or antibody  
 Attached to magnetic beads

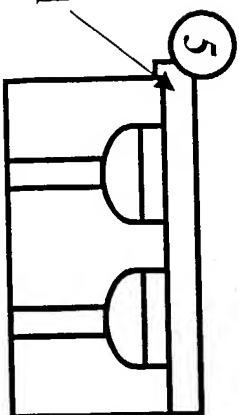


Aspiration  
 from top



Imaging

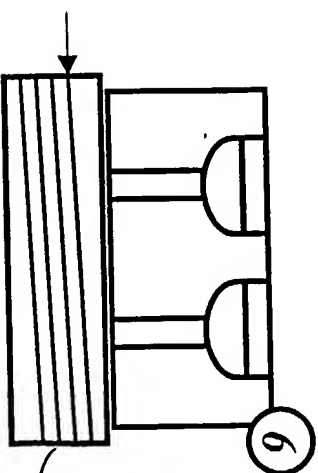
Mixing  
 circle



Binding interaction

De-magnetize

Magnetize  
 & Washing  
 circle



480

FIG. 38A

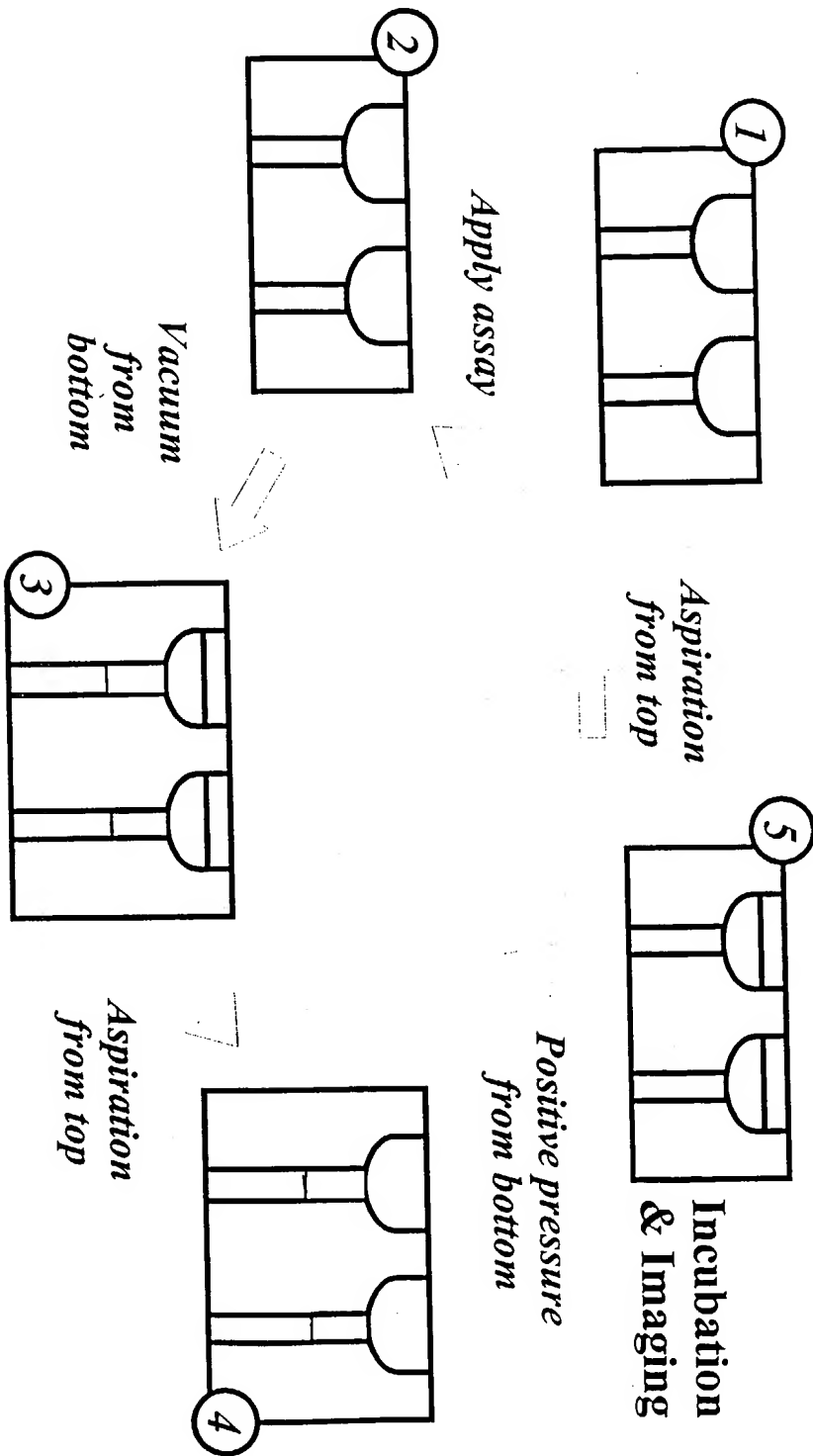


FIG. 3B



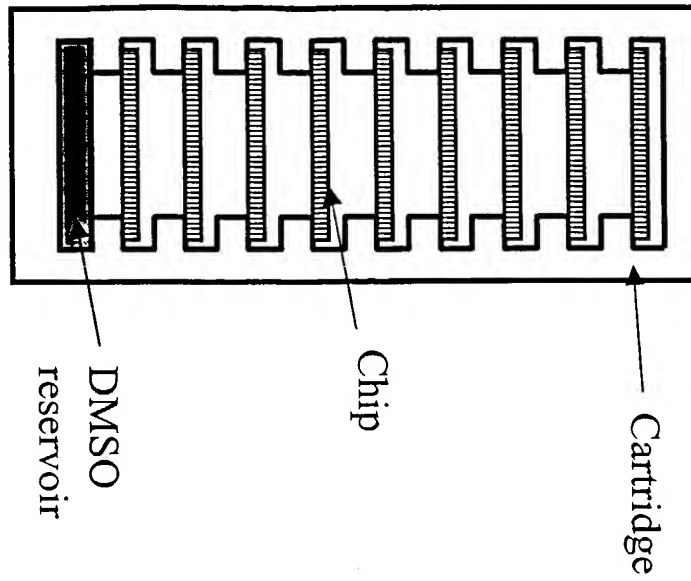
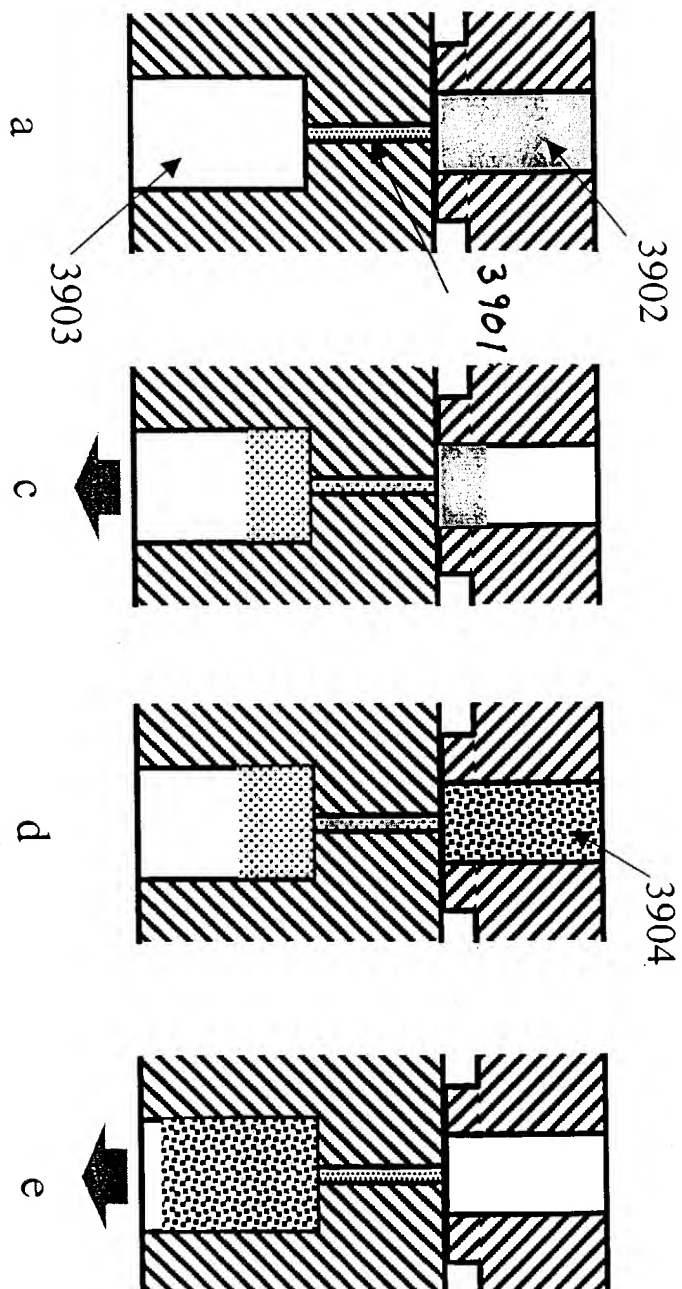


Fig. 39 One embodiment of the capillary array cartridge design

Fig. 40 Metering with through hole plates and mixing



3901 – compound and compound storage chamber  
 3902 – reagent A (i.e. enzyme) in through hole plate A  
 3903 – mixing/reaction chamber  
 3904 – reagent B (i.e. substrate) in through hole plate B